THE GEOGRAPHICAL REVIEW

VOLUME III

JANUARY–JUNE, 1917

PUBLISHED BY

THE AMERICAN GEOGRAPHICAL SOCIETY

BROADWAY AT 156th STREET

NEW YORK

FEB 5 1917
UNIV. OF MICH.
LIBRARY

THE GEOGRAPHICAL REVIEW

PUBLISHED BY

THE AMERICAN GEOGRAPHICAL SOCIETY
OF NEW YORK

JANUARY

1917

THE GEOGRAPHICAL REVIEW

Published monthly by the American Geographical Society
Broadway at 156th Street, New York, N. Y.

January, 1917

PAGE

Some Effects of Environment on the Fuegian Tribes. By Charles Wellington Furlong, F.R.G.S. (2 maps, 8 photos) 1

The Frontier Region of Mexico. (1 text-map, 1 insert map in color, 4 photos) 16

Central England during the Nineteenth Century: The Break-down of Industrial Isolation. By B. C. Wallis. (12 maps, 6 diagrs.) 28

The Position of the New England Peneplane in the White Mountain Region. By A. K. Lobeck. (1 map, 4 diagrs. on one insert, 3 photos) . . . 53

Atlantis, the "Lost" Continent: Review of Termier's Evidence. (1) By Rudolph Schuller; (2) By Charles Schuchert 61

Geographical Record 67

American Geographical Society

Meetings of December 67

North America

A Proposed 30-Mile Tunnel under the Cascade Mountains . . . 67
The Exploitation of Potash in Nebraska 67
Bureau of Soils Publications as Geographic Material 68
The Forests of Porto Rico 68
Central American Railroads 69

South America

Human Life in the Flood Region of Lowland Bolivia 69
The Argentine Census of 1914 70
Physical Changes during Historic Time in the Rio de la Plata Estuary . . 70

Europe

Revival of the English Channel Tunnel Project 71
Iron Mining in Normandy 71
The Revolution in Russian Agriculture 71
The Economic Divisions of Albania 72

Africa

New Evidence on the Age of the Zimbabwe Ruins of Rhodesia . . . 72
Pastoral Control in the Transkei Territories of the Cape Province . . 72

Asia

A Numerical Estimate of the Christians of the Turco-Persian Border . . 73
Sir Aurel Stein's Latest Expedition in Central Asia 74
Rainfall and Crops in India 74

Australasia and Oceania

Upper Air Research in Australia 75
Extension of the Boundaries of the Gilbert and Ellice Islands Colony . . 75

Physical Geography

The Melting of Snow 75
The Origin of Cyclones and Anticyclones 75

Geographical News

Personal 76

Geographical Publications (Reviews and Titles of Books, Papers, and Maps) 77

The Society is not responsible for the opinions or the statements of writers in the Review

Single numbers, fifty cents — Five dollars a year

Entered as second-class matter, January 22, 1916, at the Post Office at New York, N. Y., under the act of August 24, 1912

AMERICAN GEOGRAPHICAL SOCIETY

OFFICERS AND COUNCILORS FOR 1917

President

JOHN GREENOUGH

Vice-Presidents

ANTON A. RAVEN
Term expires 1918

JAMES B. FORD
Term expires 1919

PAUL TUCKERMAN
Term expires 1920

Foreign Corresponding Secretary

PROFESSOR WILLIAM LIBBEY
Term expires 1918

Domestic Corresponding Secretary

ARCHIBALD D. RUSSELL
Term expires 1920

Recording Secretary

HAMILTON FISH KEAN
Term expires 1919

Treasurer

HENRY PARISH, JR.
Term expires 1918

Councilors

BANYER CLARKSON
EDWIN SWIFT BALCH
EDMUND L. BAYLIES
WALTER B. JAMES, M.D.
H. STUART HOTCHKISS
Terms expire 1918

REAR-ADM. FRENCH E. CHADWICK
FRANK BAILEY
LEVI HOLBROOK
CHARLES A. PEABODY
ARCHER M. HUNTINGTON
Terms expire 1919

CHARLES H. TWEED
MADISON GRANT
GRENVILLE KANE
ALLISON V. ARMOUR
ALEXANDER HAMILTON RICE, M.D.
Terms expire 1920

Editorial Staff

ISAIAH BOWMAN, Ph.D., Director
W. L. G. JOERG
LEON DOMINIAN
G. M. WRIGLEY

Contributing Editors

ALBERT PERRY BRIGHAM, A.M., Colgate University
WILLIAM M. DAVIS, Hon. D.Sc., Ph.D., Harvard University
WILLIAM CHURCHILL, F.R.A.I., The Carnegie Institution of Washington
EDWARD L. STEVENSON, Ph.D., Hispanic Society of America
ROBERT DeC. WARD, A.M., Harvard University
RICHARD E. DODGE, A.M., Teachers College, Columbia University
ELLSWORTH HUNTINGTON, Ph.D., Milton, Mass.
MARK JEFFERSON, A.M., State Normal College, Ypsilanti, Mich.
DOUGLAS WILSON JOHNSON, Ph.D., Columbia University

314042

OBJECTS OF THE SOCIETY

The objects of the American Geographical Society are to collect and disseminate geographical information by discussion, lectures, and publications; to establish in the chief city of the United States a place where may be obtained accurate information on every part of the globe; and to encourage such exploring expeditions as seem likely to result in valuable discoveries in geography and the related sciences.

The American Geographical Society is the oldest geographical society in the United States. When it was founded, in 1852, there were but twelve similar societies in the world. Now it exchanges publications with more than four hundred scientific associations. The Society issues a monthly magazine of unusual interest called *The Geographical Review*. It has also a large and growing library—one of the most important geographical libraries of the world; thousands of maps and charts; and a remarkable collection of atlases of the sixteenth, seventeenth, and eighteenth centuries.

Travelers, men of science, and others properly accredited are welcome at the rooms of the Society and may freely use the book and map collections.

Two gold medals have been founded by the Society, the *Cullum Geographical Medal* and the *Charles P. Daly Medal*, which are awarded from time to time to explorers, writers, and men of science who have contributed to the advance of geographical knowledge.

In addition it awards the *David Livingstone Centenary Medal*, founded by the Hispanic Society of America.

The qualifications for Fellowship are an interest in exploration and travel, in the spread of geographical knowledge, and in the advancement of science.

A Fellow is entitled to the use of the Library, Reading and Map Rooms; to admission to all lectures and exhibitions; and to the Society's current publications, which include, besides the magazine, occasional books and maps.

The annual dues are ten dollars.

FORM OF BEQUEST

*I do hereby give and bequeath to the American Geographical Society of New York*_____

TABLE OF CONTENTS

PRINCIPAL ARTICLES

NORTH AMERICA — PAGES

—— **Association of American Geographers, The New York Meeting of the** 140–143

BROOKS, C. F. **New England Snowfall.** (20 maps) 222–240

JEFFERSON, MARK. **Our Trade in the Great War.** (3 diagrs.) 474–480

JILLSON, W. R. **The Volcanic Activity of Mount St. Helens and Mount Hood in Historical Time** 481–485

JOHNSON, D. W. **Is the Atlantic Coast Sinking?** 135–139

KLOTZ, OTTO. **The History of the Forty-ninth Parallel Survey West of the Rocky Mountains.** (1 map) 382–387

LOBECK, A. K. **The Position of the New England Peneplane in the White Mountain Region.** (1 map, 4 diagrs. on one insert, 3 photos) .. 53–60

MACDOUGAL, D. T. **A Decade of the Salton Sea.** (1 map, 7 photos) 457–473

—— **Mexico, The Frontier Region of: Notes to Accompany a Map of the Frontier.** (1 text-map, 1 insert map in color, 4 photos) 16–27

REEVE, S. A. **Congestion in** [American] **Cities.** (5 photos) 278–293

SHREVE, FORREST. **A Map of the Vegetation of the United States.** (1 insert map in color) 119–125

TYRRELL, J. B. **Early Exploration of the Churchill River** 375–381

VAN CLEEF, EUGENE. **The Influence of Weather on Street-Car Traffic in Duluth, Minnesota.** (4 diagrs.) 126–134

SOUTH AMERICA

FURLONG, C. W. **Some Effects of Environment on the Fuegian Tribes.** (2 maps, 8 photos) 1–15

FURLONG, C. W. **Tribal Distribution and Settlements of the Fuegians, Comprising Nomenclature, Etymology, Philology, and Populations.** (3 maps, 4 photos) 169–187

MILLER, L. E. **The Land of the Maquiritares** [Upper Orinoco]. (9 photos) 356–374

MILLER, L. E. **Up the Orinoco to the Land of the Maquiritares.** (1 map, 9 photos) 258–277

ROOSEVELT, THEODORE. **The Andes of Southern Peru: A Review** 317–322

SCHULLER, RUDOLPH. **The Date of Oviedo's Map of the Maracaibo Region.** (1 map) 294–302

EUROPE

JOHNSON, D. W. **The Conquest of Rumania.** (1 map, 3 photos) 438–456

MARTONNE, EMMANUEL DE. **The Carpathians: Physiographic Features Controlling Human Geography.** (3 text-maps, 1 insert map in color, 3 diagrs., 10 photos) 417–437

RUSSELL, W. S. C. **Askja, A Volcano in the Interior of Iceland.** (1 map, 5 photos) 212–221

WALLIS, B. C. **Central England during the Nineteenth Century: The Breakdown of Industrial Isolation.** (12 maps, 6 diagrs.) 28–52

AFRICA

PAGES

HOBBS, W. H. **A Pilgrimage in Northeastern Africa, With Studies of Desert Conditions.** (1 map, 11 photos) 337–355

AUSTRALASIA AND OCEANIA

MJÖBERG, ERIC. **A Proposed Aërial Expedition for the Exploration of the Unknown Interior of New Guinea.** (2 maps, 11 photos) 89–106

GENERAL

BABCOCK, W. H. **Atlantis or Antillia (Further Contributions to the Problem of Atlantis, II)** 392–395

BALCH, E. S. **Atlantis or Minoan Crete (Further Contributions to the Problem of Atlantis, I)** 388–392

HUNTINGTON, ELLSWORTH. **The Geographical Work of Dr. M. A. Veeder** [Relation of terrestrial to solar meteorology]. (1 diagr., 1 photo), 188–211, 303–316

HYDE, W. W. **The Development of the Appreciation of Mountain Scenery in Modern Times.** (4 photos) 107–118

REEVE, S. A. **Congestion in Cities.** (5 photos) 278–293

—— **Roosevelt, Colonel Theodore, Presentation of the David Livingstone Centenary Medal to** 253–257

SCHUCHERT, CHARLES. **Atlantis, The "Lost" Continent: A Review of Termier's Evidence, II** 64–66

SCHULLER, RUDOLPH. **Atlantis, The "Lost" Continent: A Review of Termier's Evidence, I** 61–64

DEPARTMENTS

Geographical Record ..... 67–76, 144–155, 241–247, 323–330, 396–405 (1 map), 486–497.

Geographical Publications 77–88, 156–168, 248–252, 331–336, 406–416, 498–504

Officers and Councilors of the American Geographical Society for 1917 .. iii

Objects of the Society iv

Index 505–540

Errata 541

Separate Illustrations

Map of the Frontier Region of Northern Mexico, 1:4,300,000 .... Pl. I, opp. p. 24

[Four] **Profiles of the New England Peneplane in the White Mountain Region** ..... Pl. II, opp. p. 56

[Map of the] **Vegetation Areas of the United States,** compiled by FORREST SHREVE, 1:9,600,000 ..... Pl. III, opp. p. 124

Physiographic Map of the Carpathians, by EMMANUEL DE MARTONNE, 1:2,500,000 ..... Pl. IV, opp. p. 432

THE
GEOGRAPHICAL REVIEW

VOL. III JANUARY, 1917 NO. 1

SOME EFFECTS OF ENVIRONMENT ON THE FUEGIAN TRIBES

By CHARLES WELLINGTON FURLONG, F.R.G.S.

Today, when the uttermost corners of the earth are being discovered and explored and when, through various applied sciences and inventions, man is more and more regulating his surroundings, the study of environmental influence must claim our attention. Most valuable in the elucidation of its problems are the data obtainable among primitive peoples. With them the response to environment is most simple and direct, and the *technique of existence*, as I define the different ways in which different peoples do the same things, is least varied and complex.

Among the most primitive, most rapidly disappearing and least known of the world's inhabitants are those peoples living in the cold southern antipodes of South America. For the ethnologist and geographer they have an interest correspondingly great. They embrace the tribes living in Fuegia and that part of Patagonia from about 47° S. Fuegia I would define as that region lying south of the Strait of Magellan and terminating in the Diego Ramirez Islands (56° 30′ S.). Patagonia extends from the Strait of Magellan north to the Rio Negro (39° S.).

Fuegia comprises a vast archipelago: its islands are the unsubmerged portions of the Andean chain where it dips into Drake Strait, to reappear on the Antarctic Continent; its channelways are sunken Andean valleys through which swirl and eddy the icy currents of the southern oceans.

Throughout practically the entire year Fuegia feels the cold Antarctic breath of the terriffic southwesterly to northwesterly gales that pound upon its coasts of granite and greenstone. The Antarctic Current eternally chills its shores, and snow, storm, and lowering grayness hang like a grim canopy over its snow-clad mountain peaks. An acquaintance in Punta Arenas told me of a lone missionary to these parts who kept a

meteorological record which showed during the year three hundred days of rain and storm—the other sixty-five not pleasant.[1]

Except where the great combers pound in on certain exposed rock-girt portions of these coasts, the mountain slopes and valleys are clothed with a sylvan and floral growth almost tropical in its luxuriance. Water-soaked bogs underlie the dense forests, which reach tree line at about eighteen hundred feet. The prevailing southwest winds sweeping up from the Antarctic Ocean reach these coasts heavily moisture-laden. Deflected upwards on the western slopes of the Andes, they are cooled, and rapid condensation takes place. Precipitation is almost continuous: on the lower slopes as rain, responsible for the thick forest covering and bog; on the upper slopes and peaks as snow, giving these regions their eternal icy crowns of white and here and there spilling their glaciers into the channelways.

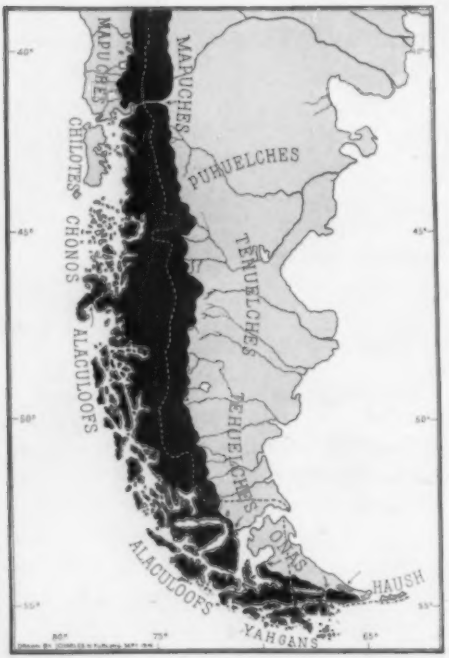


FIG. 1—Map of Patagonia and Tierra del Fuego showing effect of environment on migrations and tribal distribution. Scale, 1:20,000,000.

Gray areas represent occupied territory. Black areas represent the great mountain barriers separating these territories. Arrows indicate passes through this barrier and consequently the possible points of contact between certain of these tribes. Small cross-lined area in the extreme south represents a semi-barrier of difficult traveling country between the Onas and the Haush. The white dotted line represents the present boundary line between Chile and Argentina. It is interesting to note that this line, particularly if we include the Strait of Magellan as an ancient water barrier, today follows almost identically the center of the barrier which formed the boundary between the American tribes.

North of the Strait of Magellan the same relations of wind and topography hold good, but the Andean chain is higher and the region presents more marked climatic contrasts. One may pass from the cold, forested, rain-soaked region of the western slopes to the eastern side of the divide, onto great treeless semi-arid plains, whose barren wastes slope toward the Atlantic. Over these *pampas* rip and tear the *pamperos*, terrific winds dry-sucked of their moisture on the Pacific slopes.

[1] There is, however, much variety in weather. At Ushuaia, where the Argentine government maintains a meteorological station, the average annual rainfall (1896-1907) is only 21.5 ins. (547 mm.). Ushuaia occupies a sheltered position. Staten Island, at the extreme southeast of Tierra del Fuego, has three times as heavy a precipitation.

For Ushuaia the following temperature values, for the period 1904-1907, are extracted from "Climate of the Argentine Republic" by Walter G. Davis, Buenos Aires, 1910: highest monthly mean, 10.0°C; lowest monthly mean, −1.7°C; absolute maximum, 27.0°C; absolute minimum, −20.2°C.

These regions still support remnants of their autochthonous inhabitants. Over the dry, wind-swept plains roam the Patagonians, comprising principally the Puhuelches (northern people) and Tehuelches (southern people). Since the advent of the Spaniard they have become horse people. Through the weird maze of the Patagonian archipelago cruise canoe peoples, in the north the Chonos and Chilotes, in the south the Alaculoofs (also spelled Alaculufs). These last extend into the Fuegian archipelago. In

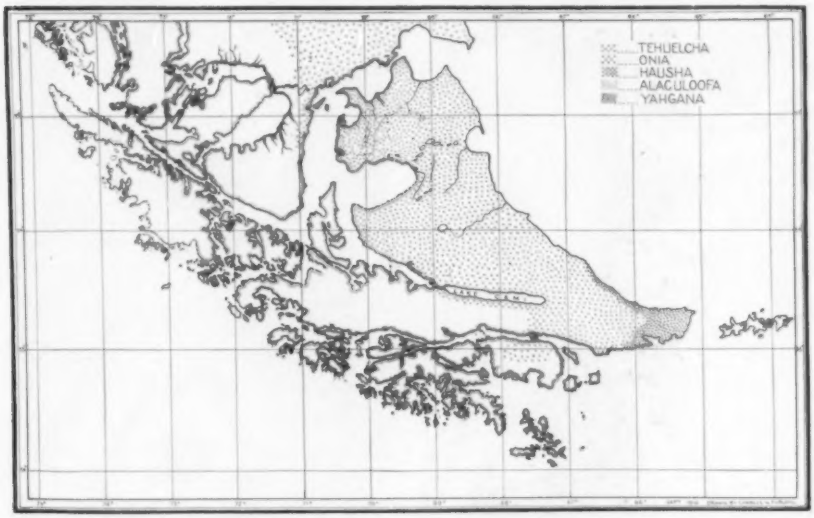


FIG. 2—Map of southernmost Patagonia, the Strait of Magellan, and Tierra del Fuego, showing tribal distribution. Scale, 1:6,500,000.

The names in the key represent regional designations and are derived from the tribal names. The territory of each tribe is considered to be that frequented by it, even though occupied seldom and by but a few members of the tribe. All blank spaces represent unoccupied territory. Tehuelcha extends north farther than here shown and south to the edge of the strait. Onia extends to the strait on the west and also along Lake Cami. Some Onas have been exiled to Dawson Island. A few have occasionally visited Punta Arenas. Alaculoofa extends up the Patagonian archipelago farther north than shown on this map, and a few families have extended their migrations into Yahgana as far as the vicinity of Murray Narrows. An occasional Yahgan has reached Patagonia. I found one at Lago, Argentina, and two to my knowledge have reached Dampier Island. Others have been taken by missionaries to Keppel Island in the Falklands.

that inconceivable labyrinth dwell the southernmost inhabitants of the world.

On the largest island, Tierra del Fuego, live that splendid tribe of foot people, the Onas, with a remnant of a practically extinct tribe, the Haush (Howsh). In the tortuous channelways and open reaches southward, clear to Cape Horn, live another canoe tribe, the Yahgans (Yäh′ gans). These regions, extending nearly fifteen hundred miles farther south than the Cape of Good Hope, were, I believe, among the last of the earth's habitable portions to be occupied by man.

Whence came these late migrations and why? Ask of these people them-

FIG. 3.

FIG. 4.

FIG. 3—Fragments of the great Andean barrier: A midsummer day on Ponsonby Sound; Packsaddle Island showing dark. An exceptionally calm spell.
FIG. 4—Alaculoof canoe in the Patagonian archipelago. A quiet hour between storms.

selves? You ask in vain. History and tradition they have none. Their prohibition against mention of the dead precludes this, and it is impossible to obtain names or genealogical facts prior to three generations back at best. Although discovered in 1520, not until the nineteenth century was any kind of scientific study of these people begun.

The physical features of the Americas have favored meridional movement. In the southern continent the north-south direction of the Amazon's great tributaries and of the La Plata system, as well as the trend of the vast Andean chain, the channelways of the Patagonian archipelago, and the Argentine pampas mark clear routes for north-south migrations, and in the regions south of 40° S. the movement appears to have been to progressively higher latitudes.

Among the primitive and semi-civilized peoples the weaker tribes or groups are naturally driven from the more desirable lands to those where it is more difficult and hazardous to obtain food. Thus, not infrequently, are they forced to the outermost edges of territories, and on maritime fringes they necessarily become fisher folk. May we not assume that the progenitors of these tribes who occupy the uncompromising southern regions of South America did not by choice leave the more productive lands to their north but were driven south by stronger peoples?

North of Patagonia, beginning at about 41° 30′ on the western slopes of the Andes, the more open, desirable coastal strip of Chile was occupied by a strong, fearless race, the Mapuches (Máh-poo-ches), whose territory extended over the Andean divide by way of the fertile pampas regions of northwestern Patagonia. It is reasonable to suppose that the Mapuches (Araucanians) forced southward a weaker tribe, this in turn pushing farther southward a tribe still weaker, and so on.

These tribes naturally followed the paths of least resistance: the fisher folk in their canoes down the Patagonian channelways, the foot peoples down the Patagonian plains and onto the plains of northern Tierra del Fuego. It is a significant fact that each successive tribe of the canoe peoples one finds in going south is weaker than its northern neighbor, from the Mapuches to the Chonos, Chilotes, Alaculoofs, and Yahgans. As we pass southward down the pampas country of Patagonia and Tierra del Fuego this same sequential relation exists amongst the foot peoples from the Mapuches to the Puhuelches, Tehuelches, Onas, and Haush.

When these migrations took place is as yet undetermined, but the vast number and size of the kitchen-middens found along the coasts, particularly in the regions of Cape Horn, indicate that the progenitors of the Yahgans at least were here long before Magellan's caravels first passed through the strait which bears his name. And it is possible that, by the scientific study of these shell heaps and their contents, the approximate time of the first migratory period might be ascertained.

The purpose of this article is to deal especially with the tribes of the

Fuegian archipelago: the Yahgans, Alaculoofs, Haush, and Onas, and with their general relationships to the southern Patagonians (Tehuelches), but more particularly with the general effect of environment on these Fuegians (Firelanders). The effect of environment is potently direct and correspondingly easy of interpretation.

From the Andean pass[2] in the vicinity of latitude 40° 30′ S., over which the Mapuches travel to and fro between the plains of the west coast and the northern Patagonian pampas, the ranges of the Andes form a practically impassable barrier—except where the Strait of Magellan breaks through—for over a thousand miles south, where they terminate in a crescent sweep

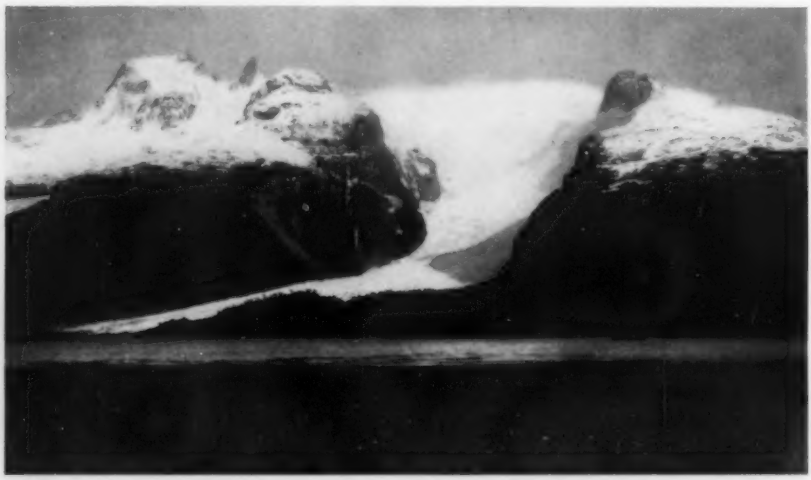


FIG. 5—The great barrier from the Alaculoof point of view: Cerro Balmadeda near Last Hope Inlet, Patagonian archipelago.

to the southeastward, along the southern half of Tierra del Fuego and the outlying islands.

This impassable wall of precipitous ice-capped peaks and dense, forested, boggy lower slopes must have barred all communication between the canoe peoples of the Patagonian channels and the foot peoples of the Patagonian plains. Likewise it barred communication between the foot peoples of the open country of northern Tierra del Fuego and the canoe people of Beagle Channel on the other side of the ranges to its south.

But there is the one great break in the barrier, the Strait of Magellan, to the eastern half of which the canoe peoples eventually paddled their frail barks and established communication with the then foot peoples of southern Patagonia. By reason of the swift currents and the open reaches, and the lack of landing places, food, and wood, together with the nomadic char-

[2] The famous Perez Rosales Pass, 3,200 feet (980 m.), the southernmost of the several passes in this part of the Cordillera.

acter of the small roaming bands of both the foot and canoe peoples, this communication—probably for the purpose of trading their meager possessions and bartering for wives—must at best have been very slight. The Patagonian mainland in the vicinity of First Narrows, where the foothills merge mountains with plains, suggests itself as their principal point of contact.

The Strait of Magellan, which broke the Andean chain, undoubtedly proved in itself to be a transverse barrier to the southward migrations of the foot peoples. That the foot peoples of Tierra del Fuego crossed from what is now Patagonia before nature depressed the earth's surface hereabouts and gave origin to this waterway is scarcely tenable. It is my opinion[3] that the canoe peoples reached Tierra del Fuego before the foot peoples and that the progenitors of the present Ona and Haush tribes, being the weaker of the foot peoples, had been driven to the southern and more arid portions of Patagonia bordering the strait and there remained until they engaged the canoe peoples to transport them to the more fertile undulating plains of northern Tierra del Fuego.

This transporting probably occurred at slack water at the narrowest portions of the eastern half of the strait, now known as First and Second Narrows. Here, thankful for the barrier between them and their enemies—probably the Tehuelches—they hunted the guanaco; and, incidentally, the Onas drove the still weaker Haush to the less propitious and more exposed southeastern corner of the island.

In Tierra del Fuego, also, the great barrier of the Andes for a long period shut off all communication between the canoe and foot peoples. To the south, however, another strait, Beagle Channel, made possible occasional communication between small groups of Yahgans and Onas, the latter occasionally working over a pass toward the eastern end of the range. Undoubtedly the Yahgans had slightly more frequent communication with the Haush than with the Onas, as they could reach their country by canoe, but this intercourse, too, was restricted by the open and exposed character of the corner where the Haush dwelt.

Brecknock Peninsula, the western extremity of Tierra del Fuego, forbiddingly intercepted frequent association between the Yahgans and the Alaculoofs, while the Taytao Peninsula, far to the north of the Patagonian archipelago, undoubtedly formed another barrier between the Patagonian channel tribes and those of the Chonos archipelago.

These barriers were undoubtedly responsible to a great extent for either the development or the perpetuation of the great linguistic differences of these tribes, for each has a distinct language. Apparently not even a "chinook," or trade language, exists between them, although in the limited

[3] A contrary view is held by others. See discussion in "Los Indígenas de la Tierra del Fuego" by Roberto Dabenne, *Bol. Inst. Geogr. Argentino*, Vol. 25, 1911, pp. 163-226 and 247-300, Buenos Aires. This article contains a valuable bibliography.—EDIT. NOTE.

FIG. 6.

FIG. 7.

FIG. 6—Yahgan canoe of type now prevailing, Beagle Channel.

FIG. 7—Yahgan canoe, Beagle Channel; woman paddling. North coast of Navarin Island in background.

FIG. 8.

FIG. 9.

FIG. 8—Two Tehuelche men at Tres Lagunas between Gallegos and Santa Cruz Rivers. Note the plains country. (Copyright by Charles Wellington Furlong.)

FIG. 9—Interior boggy country of Tierra del Fuego: Part of the Furlong expedition on north side of the Tierra del Fuego coast range. Note black on pack saddle of center horse, caused by the animal having just been "bogged."

vocabulary of the Haush obtainable I find a number of words identical with the Ona. This fact, however, is readily explicable, for there is no great natural barrier, only difficult traveling, between the territory of the Ona and the Haush, and contact must have been much more frequent than between the other Fuegian tribes. This circumstance also has perhaps been responsible for the near extinction of the Haush.

Otherwise the barriers have made for the isolation, hence the preservation, of the weaker tribes. These people were able not only to hold their own, but to thrive against those cohorts of nature, storm, cold, dearth of food; but the coming of the white man with the artifices, vices, and diseases of civilization was as the touch of a deadly thing. Moreover his attitude before long became that of active enmity: he was covetous. He wanted the northern open country of Tierra del Fuego for his sheep; hence he drove the Onas from their hunting grounds to the thick impenetrable forests and bog-soaked mountainous regions of the southern half of their islands, where no man cared and few men dared to follow.

Its unattractiveness made Fuegia an asylum. Here is a sub-Antarctic climate, where grains do not ripen, where in its most protected parts under care only the hardiest bulbous vegetables can be counted on to stand the frosts. This condition is not due so much to extreme cold or length of winter as to lack of heat in summer, for even in December, the Fuegian midsummer, gales of sleet and snow are often of hourly occurrence. It is "a land where nature seems not only to resent the intrusion of mankind, but at every hand to thwart and harass his existence." It caused its inhabitants long to be dissociated from the world; its limitations of primary resources forced them into an existence of almost unsurpassed nomadism and primitiveness which, in turn, has had a very direct effect upon their social organization.

In the first place, the Yahgan's environment has limited his food supply. It consists of perhaps twenty varieties of fungi, mussels, limpits, fish, shore and sea birds and their eggs, seals, and the blubber of an occasional stranded whale. Environment also makes this scant variety most hazardous in the getting. The Yahgan must dive into the icy waters for shell fish, scale dangerous cliffs for eggs and venture into the storm-swept channelways, broad reaches of the sounds and the very oceans themselves in search of these things. To obtain food the Yahgans have perforce become a canoe people: their principal, though crude, craftsmanship is canoe building.

Before the recent acquisition of white men's clothes, their limited native clothing consisted of a skin of seal or sea otter, used as a sort of shoulder cape; otherwise they went naked. Thus their environment forced, to a marked degree, the survival of the fittest.

Their conical or semi-spherical wigwams of beech boughs, sometimes walled with slabs of bark and pitched on mussel heaps, are among the most primitive in existence; nomadism prevented the developing and

building of permanent domiciles. Architectural development, like the invention of domestic conveniences, comes from reasonable permanency of abode and from gregariousness. With the Yahgans these are impossible.

All of these conditions have affected their physique. The tallest Yahgan (Beagle Channel) I ran across measured 5 feet 9¾ inches, and, of some fourteen measurements of males taken, the average was 5 feet ⅞ inch, the women being relatively shorter. This is due to shortness of leg rather than of body and is particularly noticeable in the women, who do most of the paddling and whose walk is a waddle. Their legs have become stunted through continuous squatting in canoes. Yahgan children are well formed and proportioned. At the missionary John Lawrance's ranch at Laui on Beagle Channel there were over a dozen Yahgan youths all of whom were well proportioned. Why? Because they had spent the greater part of their lives in active work ashore, herding sheep on the ranch.

Although the Yahgan is as gregarious as his food supply and *wanderlust* will permit, his opportunities for communal intercourse are necessarily limited. Occasional gatherings of a hundred or more may occur at the driving ashore of a stranded whale, but the greater part of the time the people are scattered about the archipelago in single families or two perhaps, living isolated far from their central meeting places.

This primitive social organization in turn affects the form of government. Each canoe may be said to represent an independent authority, the most complete form of government known among the Yahgans. In answer to the blue signal smokes for the gathering of the families, they assemble at some fixed rendezvous, dwelling as a community perhaps for some weeks, each bringing with him that inflexible independence which will owe allegiance to no man, and in consequence they have no chiefs.

They do, however, occasionally show deference to a *yuccamoosh* (medicine man), or to a wise older man, and revere experience and physical prowess. They are strongly socialistic, but only lack of greater communal intercourse is responsible for their lack of leaders. The absence of this most elemental attribute, chieftainship, which even the most barbaric of races usually acquire, is one characteristic which pre-eminently distinguishes them from the rest of mankind.

The Yahgan's environment, through its effect on his social organization, has naturally had a marked effect on his customs. Through lack of social organization there has been a lack of development of rites, ceremonies, and all that complexity of social usage in which customs are developed and involved. Those customs which they have are in many cases directly affected by their material environment. Take, for instance, the matter of personal decoration. Whether for pure love of decoration itself or as a symbol of war or death, it is limited to their own crude resources: shell necklaces, head fillets of down, simple bracelets of sinew, or the three somber color pigments, charcoal black (*yupooshug*), dull white (*toomoorahbo*), and dull

red ochre (*emi*)—earthly material found along the shore which, ground to powder, is used to besmirch their bodies.

Their industries are limited to their simple needs and the materials nature produces to supply them—sinew for their strings, fish line and sling cords; whale or seal bone for their spear-heads, and wood for their shafts; shells for saucers; a wild carex, from which the women weave, with a peculiar knot, their baskets; iron pyrites, from which with difficulty they make their fires; the big slabs of thick bark and whalebone from which their most honored men, the expert canoe builders, construct their craft. To such meager materials nature has restricted her southernmost children of the world.

These Yahgans have been classed as the most savage and least developed people of the world, addicted to treachery, bloodthirstiness, and even cannibalism. The sight of a long-haired figure crouching within his wigwam of beech boughs, dwarfed and stunted from squatting in canoes, large-headed, with a countenance rendered hideous by the fight for existence against cold, want of food, and isolation, would seem to bear out these statements, but I doubt if his white brother, dwelling under these conditions, providing he could survive, would be more attractive in appearance.[4]

There is an absence of any form of worship or religion in the general acceptance of the term. Although the Yahgan is both an animist and a polydemonist, weird nature, whose phenomena he has personified in his imagination, has also by her exigencies dwarfed his introspection. When a man dies "he is gone" the Yahgans say,—"is no more." They blot out his memory, do not mention his name, split his canoe in twain, and destroy his belongings.

Like causes, with like resultant effects, have controlled the development of the Alaculoofs. The Alaculoofs resemble the Yahgans in general appearance, customs, and character, but they are better clothed and of sturdier fiber. They are quite untractable, and their language is distinctly different. They have pushed the Yahgans south and occupy a slightly better territory. The barrier of Brecknock Peninsula has served to keep their language distinct from that of the Yahgans. Today only a few chance canoes of these people are seen. Their decrease, tribal groups and settlements, as well as that of the other tribes, will be taken up in a succeeding article.

The Onas, like the Yahgans and Alaculoofs, have no proto-history or history of themselves. Their features are of Mongol type, and they resemble the Yahgans in many ways but are of much finer physique and may be considered a tall people. The average height of eleven I measured was 5 feet 9 inches, the tallest, Pupup, being 6 feet 1 inch. I was impressed with the fact that these latitudes and this climate seem to induce growth,

4 A study of the mentality of these people, especially on the phenomena of psychoneuroses, has been made by me in collaboration with the well-known psychopathologist, Dr. Isador H. Coriat of Boston. See his paper read at the sixth annual meeting of the American Psychopathological Association and published in the *Journal of Abnormal Psychology* for August and September, Boston, 1915.

FIG. 10—Onas, Tierra del Fuego. These primitive folk still live the life of the Stone Age. (Photo copyright by Charles Wellington Furlong.)

a phenomenon also noticeable in instances of white men as well as certain of the limited fauna of that land.

The Onas have heavy malar bones and supra-orbital ridges. Their head hair is dark, full, but not coarse. Like the Yahgans, they have splendid teeth, their hands and feet are small and well formed and their fingers are rather delicate and tapering. Darwin records the color of a few Fuegians (Haush) he met on the shores of Beagle Channel as a dirty coppery red, but this undoubtedly was due to the red ochre with which they had bedaubed themselves. It was not until I had seen some ochre being washed off that I discovered their true color, cinnamon in quality, but much lighter in value.

Forced by their environment to live by the chase in a hard land, they have acquired a strong physique and have developed wonderful endurance and exceptionally acute powers of smell, sight, hearing and sense of location. For, despite the thick forests and verdure of their land, there is a dearth of food. In part the Onas' food supply is the same as that of the Yahgans. Birds, by reason of their land hunting, are used more and fish less. To these may be added the *cururo* (*Centomys*), a kind of ground rat. But the staple food of their nitrogenous diet is the *guanaco* (*Auchenia huanaco*), often hunted with large, powerfully built hounds, resembling a cross between a Great Dane, stag hound, and setter.

The Onas are even more dependent on the guanaco[5] than were the North American Indians on the bison: its meat is their food, its warm, hairy, woolly coat, their clothing; and its hides, cured, sewn together and rubbed with red ochre, serve as a traveling wigwam. Its hide is sewn into small water-bags and cut into strips for cords, portage harness, and girdles; the sinew from the loin is twisted into bow strings and the filaments separated into thread. Even its bones are turned into primitive awls.[6]

Besides the limited fauna already mentioned, the Fuegian wolf fox is the only other large quadruped. The limited food supply, greatly diminished since the Onas have been driven south by the white man, has been responsible for the greater clannishness, inducing warfare. Often, in the belly pinch of hunger, groups trespass on their neighbor's territory. The result—a feud. However paradoxical it may seem, these feuds have probably helped to preserve the Onas, thus adjusting them numerically to their food supply and maintaining in this respect the balance of nature.

Tierra del Fuego, with a greater and more dependable food supply than the smaller islands, permits of more permanent shelter building. The Ona builds both a primitive type of bower wigwam with branches stuck in the ground interlaced and inclined toward the center, and a sort of semi-wigwam made of guanaco hides, which he uses in traveling. He has

[5] For description of the guanaco and Ona hunting methods, with plans, see C. W. Furlong: Hunting the Guanaco, *Outing Magazine*, October, 1912.

[6] See the Furlong collections in the American Museum of Natural History, New York, the Peabody Museum, Harvard University, Cambridge, Mass., the Peabody Museum, Salem, Mass., and the Museum of the American Indian, Heye Foundation, New York.

also developed two types of heavy log shelters, one cone-shaped, the other gable-shaped.

The Onas must travel afoot and carry all they possess on their backs, hence their use of a cargo harness of strips of guanaco hide. The men travel light to be prepared against a surprise attack or to secure a fleeting guanaco, the women carry on their backs the rolled-up tent with the simple camp appurtenances, with the young children in a fold of the cloak at the back of the neck. Their environment has developed a well-balanced division of labor among them, the men getting the guanaco and skinning the pelts, the women curing them; the men protecting the camps and their families from enemies, the women caring for their camps and their families; the men making their bows and arrows and certain other utensils, the women weaving reed baskets, making water-skin bags, etc.

The scarcity of food involves long journeys and militates against gregariousness, so the Onas, like the Yahgans, are forced into small clans or family groups, each for himself and his own and each group hunting in its special territory. This severe existence, alone with the elements and frequently in the country of an enemy group, has developed self-reliance, courage, stoicism, and individual independence rarely equaled, with the result that the Onas render obedience to no man. Hence they are without chiefs, but, like the Yahgans, will pay deference at times to their medicine man, whom they call *J'ho'n*, or to an elderly man of character and physical prowess. They are socialistic in their tendencies, the hunter dividing the food with the camp.

Their customs, though slightly more advanced and complex than those of the Yahgans, follow the same trend, particularly in respect of face and body painting, the ceremony of initiation into maturity, songs, doctoring and necromancy, freemasonry and superstitious conceptions. These, like their meager industries, are directly dependent on the limited physical assets of their environment. The difference between a foot people and a canoe people marks the industrial differences. The Onas were never known to build a canoe or the Yahgans to make a guanaco-skin wigwam. The Onas, a people practically living in the life of the Stone Age, produce a splendid and beautifully wrought bow and arrow.

Undoubtedly gross exaggerations have arisen concerning the Fuegians. As far as I could discover, they never used poisoned arrows, although accused of so doing, and undoubtedly they never practiced cannibalism as a rite, although, like some of their white brothers, they may have resorted to human flesh when face to face with starvation. While their elemental passions are strongly developed, they have tractable and likable qualities, and I believe are inherently intelligent. The more I have seen of these and other primitive tribes the more I am convinced of the direct and potent influences of environment. Narrower, too, to my mind, has grown the gap which some would have us believe exists between primitive and civilized man.

THE FRONTIER REGION OF MEXICO

Notes to Accompany a Map of the Frontier*

[With separate map, Pl. I, facing p. 24.]

The revolutions of Mexico may be said to have two breeding places. One is the broken, hot, and relatively moist country south and southwest of the capital city; the other is the long, desert, frontier region of the north. It is the latter that is of chief interest to citizens of this country. One of Mexico's most enthusiastic propagandists once likened the general shape of his fatherland to a cornucopia, or horn of plenty, and dwelt on the riches poured therefrom into the United States. But since military operations have been undertaken in the frontier region by revolutionists and by government troops of both Mexico and the United States, troubles rather than riches have been our chief importations from Mexico. And in the past few months much of the romance that has been associated with the memories of Spanish times has faded before the hard realities of military life in the hot, dry country through which runs the 1,600 miles of Mexican frontier.

The extended frontier of northern Mexico, lying for the most part in desert country, offers two chief difficulties to military transport: forage and water for beasts and long, sandy, or broken stretches difficult to cross. If motor transport be employed the military road becomes the chief immediate problem unless the field of operations is supplied by a railway, when its possession becomes one of the first objectives. Since labor is now nearly impossible to get, and since the materials must be hauled long distances in the United States before reaching the frontier, we may say that the problem is rather more changed in form than diminished in difficulty when we haul camp equipment, food and ammunition, medical stores and wounded by motor truck instead of horse power. Wood for fuel is still desirable, and to avoid the transport of water for the troops it is necessary to know the infrequent watering places.

There are a number of standard questions which the military man raises on looking over the possibilities of such a region. Where are the river bottoms with trees, and open plains with scrub, and mountain ranges with forest or woodland? Where are the springs and wells and desert "tanks"? Of railroads we shall speak later. At this point we wish to emphasize the character of military operations in places not reached by railroads. For the three main railway lines supply only a part of northern Mexico. And a military campaign directed against a revolution in that region, either by a central Mexican authority or by American forces, must always confront the problem of reaching in force those remote sections that are the haunts

*As to drainage, roads, and towns, the map is based on the "Map of Sonora, Chihuahua, and Coahuila, Mexico," 1:1,000,000, published in 1913 by the War College Division of the General Staff, Washington, D. C. For other sources see footnote 1.

of guerilla bands and small fugitive detachments. Trench warfare can be carried out only on the most limited scale. The power of concentration in a desert is limited even on the part of a rich nation. Northern Mexico has always been desert and it is now destitute. In the past few years trenches have been made around some of the besieged towns, but the trench stage has been short and has always been preceded and followed by tactical fighting in open country. The long and difficult march, the unexpected concentration of guns and men, in fact all the elements of surprise, are still possible over most of the frontier region.

The following notes deal with those features of the relief, climate, and vegetation of the frontier that are involved in one form or another in the problems of military control. They are followed by a reference to railways and by a note on the cities of Mexico, the two chief objectives in a protracted campaign.

The accompanying map, Plate I, represents the desert quality of the frontier region of the Southwest—the limited rainfall and the high temperatures of summer. An oval belt of exceptionally high temperature extends along the Rio Grande, and the same extremes appear again at the head of the Gulf of California. The whole region has most uncertain rains. In a single year from 12 to 20 inches of rain may fall, only to be followed by years of extreme drought, with a rainfall of but a few inches. El Paso is typical, with a rainfall as high as 18.30 inches in 1884 and as low as 2.22 in 1891.[1]

But let it not be supposed that the whole frontier region has a uniform climate and relief. The region may be divided into a number of natural provinces. At the extreme western end of the boundary and west of the Colorado River is a group of minor ranges in Southern California. East of the Colorado River is the Lower Colorado Basin of southwestern Arizona. Then comes a group of ranges which lie in southeastern Arizona and are continuous with the Sierra Madre of Mexico, the chief relief feature shown on Plate I. From El Paso southeastward runs the valley of the Rio Grande with various mountain ranges and knots on either hand such as the Guadalupe Mountains in western Texas. The lower Rio Grande runs through plains country.

Only a word is required for the westernmost section of the boundary. The frontier region here includes block mountains of less height but of the

[1] The climate, relief, and vegetation as set forth in the following description are taken with modifications from "Forest Physiography" by Isaiah Bowman, 1911. See the chapters on the Lower Colorado Basin and the Arizona Highlands, pp. 244-245 and 249-250.

The chief sources of climatic data for the map (Pl. I) were Bartholomew's "Atlas of Meteorology" and the monthly bulletins of the Observatorio Meteorológico-Magnético Central de México. The isohyets and January isotherms are based chiefly upon the former, the July isotherms upon the latter. For the immediate border region the various United States publications consulted include *U. S. Weather Bureau Bulletins Q and S, U. S. Geol. Survey Water-Supply Paper 301*, 1912 (Pl. I), and the wall map of Normal Annual Precipitation of the United States by Eugene Van Cleef (Rand-McNally Co., 1915).

Hann's "Handbuch der Klimatologie," Vol. 2, gives data for a few localities in northern Mexico, and a rainfall map is shown on p. 76, Vol. 1, of "Le Mexique au XX^{e} Siècle" (see bibliography at end of article).

FIG. 1—The river front of El Paso, Texas, with the Rio Grande in the middle ground and the Mexican town of Juarez beyond. Note the low stage of the river, characteristic of the greater part of the year, due to the general aridity of the climate. (Photo copyright by Underwood & Underwood.)

FIG. 2—The manoeuver field of the expeditionary force near the base camp at San Antonio, northern Chihuahua. The view is typical of the arid plain of this region, from which rise, island like, mountain ranges here and there, as in the right background. Note the ditches and the water hole in the foreground. (Photo copyright by Underwood & Underwood.)

same general character as the San Bernardino and San Jacinto Mountains of Southern California. The boundary crosses the Imperial Valley, famous no less for its position below sea level than for its fertile irrigated lands.

The region east of the Colorado River consists of lowlands with an extreme desert climate. The average precipitation along the entire boundary is about 8 inches and on the Yuma and Colorado Deserts it is but 2 or 3 inches. For 700 miles between the Rio Grande and the Pacific, the boundary line is crossed by only five permanent running streams. There are two periods of rainfall, one in midwinter and one in midsummer, the midsummer rainy period being known as the rainy season. The summer rains generally begin about the first of July and last until the middle of September. Soon after the first rain falls the vegetation assumes a spring-like aspect, leaves burst forth, hills and valleys are covered with grass, and a bewildering profusion of wild flowers covers the surface. The plants grow with great rapidity, their seeds mature before the rains cease, and in a month or so after the rains have stopped they have the somber colors typical of fall and winter.

On the whole the Mexican boundary district of the Lower Colorado Basin is treeless; the forests are confined almost entirely to the mountain ranges and the stream courses, but those in the latter situation are few in number and of insignificant size. On some of the desert spaces arboreal cacti and yuccas form open groves; on others, and especially the alkali spots, the ground is perfectly bare of vegetation. The streams are lined with Fremont cottonwood, black willow, box elder, walnut, sycamore, oak, mulberry, and ash.

Shrubs and grasses increase in number and variety on the foothills, and there is often an abundance of shrubbery in the ravines near timber line. The desert vegetation, with the exception of a few green-bark trees and shrubs, is dull and dusty and in general the plants have pulpy leaves, gums, and resins. Under 4,000 feet the rainfall is so low and the evaporation so high that true desert conditions prevail.

Upon the higher mountain slopes are limited areas with greater precipitation; hence islands of vegetation occur on the mountains, surrounded by great desert plains. The highest portion of the Lower Colorado province lies in south-central Arizona and includes a few mountain ranges—the Baboquivari, Carobabi, and Cobota Ranges—which break the continuity of the plains. The Gila, Mohawk, and Growler Mountains are important ranges farther west. None of them has a sufficient summit extent to provoke large quantities of rainfall, hence even the highest portions are scantily covered with tree growth.

There is a thin population along the entire boundary in the Lower Colorado region, the only towns of consequence being Douglas, Santa Cruz, Nogales, Yuma, and San Diego. Except for these towns and several score of small settlements in the principal valleys the boundary

zone between El Paso and the Colorado River has few permanent inhabitants.

The Arizona Highlands of southeastern Arizona are continuous with the Sierra Madre of Mexico and from a distinct province of the frontier region, extending across the boundary. They make a relief much more broken and distinctly higher than that of the Lower Colorado Basin province just west. Ranges worthy of mention are the San Luis (south of the boundary), San Jose, and Dog Mountains. At the summits of some of the main peaks is the Mexican white pine; on others, and growing at lower elevations also, is the yellow pine. In the fifty-mile desert west of El Paso are open "forest" patches of desert yucca, where the largest trees attain a height of 16 feet. The Fremont cottonwood is the most common, beautiful, and valuable shade tree in the whole Mexican boundary region. It grows naturally on almost every stream along the boundary and is found planted around the houses and along the irrigation ditches of almost every ranch.

A common tree or shrub through the desert Southwest is the mesquite. The vertical range is from sea level and even below sea level in the Colorado Desert up to about 5,500 feet. In the deserts of New Mexico, Arizona, and California it is a shrub which obstructs drifting sand, thus forming mounds of sand and lines of sand hills; in the most fertile places along the Colorado River and its tributaries it is a tree of considerable size. Along the Santa Cruz River in Sonora are forests of unusually large mesquite, with some individuals 2½ feet in diameter and 50 feet high.

The Rio Grande Valley consists of a string of basins connected by "shut-ins," narrower stretches where the river has cut across low ridges flanked by hills or mountains of moderate height. The Rio Grande is a storm-water stream, subject to great and sudden floods. The rainfall occurs principally in the form of violent showers or cloudbursts, which fill the dry or nearly dry stream beds of the tributaries with turbulent floods of short duration. Occasionally such floods rising at the same time in several tributaries destroy the irrigated lands of the main valley floor, where are located almost all of the principal towns.

The valley floor consists of alluvial lands cut into terraces by the river. The broadest terraces lie in the most noted basin of the valley, the "Jornado del Muerto," or "journey of death," in south-central New Mexico. It is 200 miles long by 30 or 40 miles wide, with abrupt and in places mountainous borders. The alluvial floor of the basin has a growth of grasses and stunted shrubs. Along the river bottoms are cottonwood trees. On the slopes at the basin margin with low elevations are yucca and cactus and higher up there is a scrubby growth of juniper, cedar, and oak. On the bordering ranges is a scattered tree growth, if the ranges are low; if high, they bear important growth of pine and fir. The Chisos, Davis, and Capitan

Ranges, and especially the Sacramento Range, have true woodland and forest growths between the 7,000-foot contour and the summit.

With the chief features of the relief, climate, and vegetation of the frontier in mind we may now turn to the location of the railways. They are a key to much of the military history of the region. Plate I shows the location of the three principal lines, one on the west which reaches Nogales, one in the center which terminates at Juarez opposite El Paso, and a third which crosses the Rio Grande at Ciudad Porfirio Diaz (Piedras Negras) half-way between El Paso and the Gulf. The value of the railways may be illustrated through their use by Huerta. His strategy consisted in keeping his soldiers posted, (1) in towns on the railway lines, (2) at border stations, (3) in the large cities whatever their location. Control of the railways has been essential to the life of one after another of the disorders of the frontier, since large quantities of the necessary supplies have been imported over these lines from the United States. Revolutions have therefore started at outlying points with the appropriation of live-stock which could be driven with the army and used as needed for food. Horses for mounts and mules for pack-train transportation could also be taken by force. Villages and groups of ranches became bases from which to launch attacks and furnished rough field hospitals for the wounded. Control of a section of one of the three main railways has always been one of the first objectives of a revolution in the desert country of northern Mexico.

Two years ago Professor Mark Jefferson wrote a short but very interesting account[2] of the relation of some aspects of Mexican geography to the revolution then in progress. His remarks are even more important at this time and may be quoted with but slight modification as follows:

"It is not generally realized that the revolutionary area in Mexico is far from the homes of the mass of the Mexican people and above all far below the level at which they live. Mexico is a curiously 'upstairs' country. Most of the people live on a plateau more than five thousand feet above the sea. This plateau area is outlined on the accompanying map (Fig. 5) with a dotted line. Its association with Mexican life is shown by putting on the map all the towns upwards of ten thousand people in 1910. It is evident at a glance that they are massed especially on the plateau. The population of the towns is roughly shown by the marks that represent them on the map, dots for ten thousand, bars for twenty, triangles for thirty, squares for forty, and circles for fifty thousand. Sixty thousand is shown by a dot within a circle, and so on. Three cities at the high, southern end of the plateau have over a hundred thousand: Guadalajara (118,799), Mexico (470,659), and Puebla (101,214).

"The revolution has not yet got up to this plateau, holding only the

[2] Mark Jefferson: The Revolution and the Mexican Plateau, *Bull. Amer. Geogr. Soc.*, Vol. 46, 1914, pp. 436-437, with map (here reproduced as Fig. 5).

FIG. 3.

FIG. 4.

FIG. 3—Field artillery of the expeditionary force on the march, northern Chihuahua. Note the sparseness of the desert vegetation, only the water courses, as in the background, being lined with trees. (Photo copyright by Underwood & Underwood.)

FIG. 4—Soldiers from the expeditionary force watching Mexicans trying to construct a bridge over the Santa Maria River near El Valle, northern Chihuahua, which had been destroyed by a flood. The first bridge had been built by the engineers of the expeditionary force. The landscape is typical of that along the watercourses. (Photo copyright by Underwood & Underwood.)

northern country as far south as Torreon and some of the low country about Tampico in the east and south of the plateau border between Mexico and Guadalajara. The only cities of any size that the rebels hold as yet (May 7, 1914) are Chihuahua (39,061) and Monterey (81,006). Chihuahua is in the north, just off the plateau border and too far away from the Federal base for the Federals to hold, so they abandoned it. Monterey is also off the plateau, at only 2,000 feet, by far the largest city at so low a level.

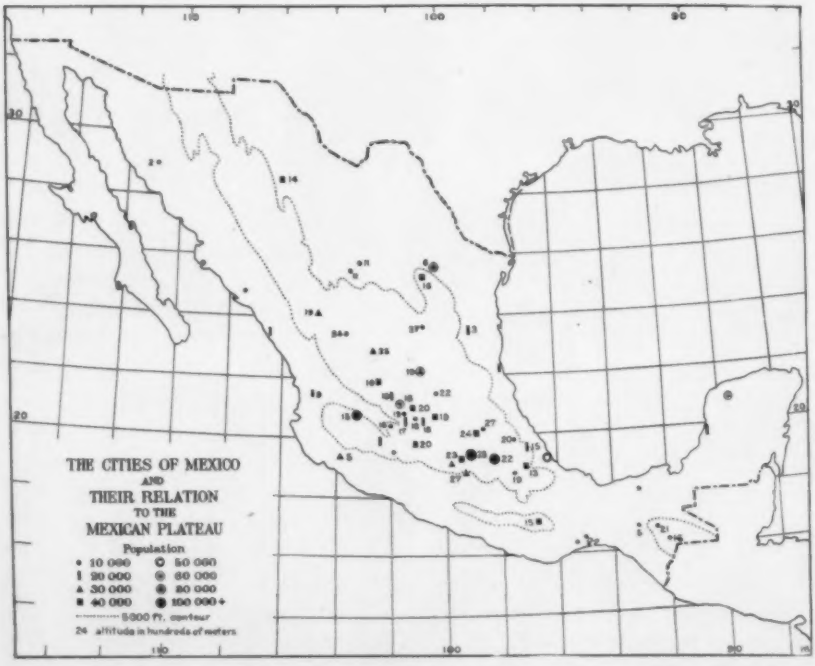


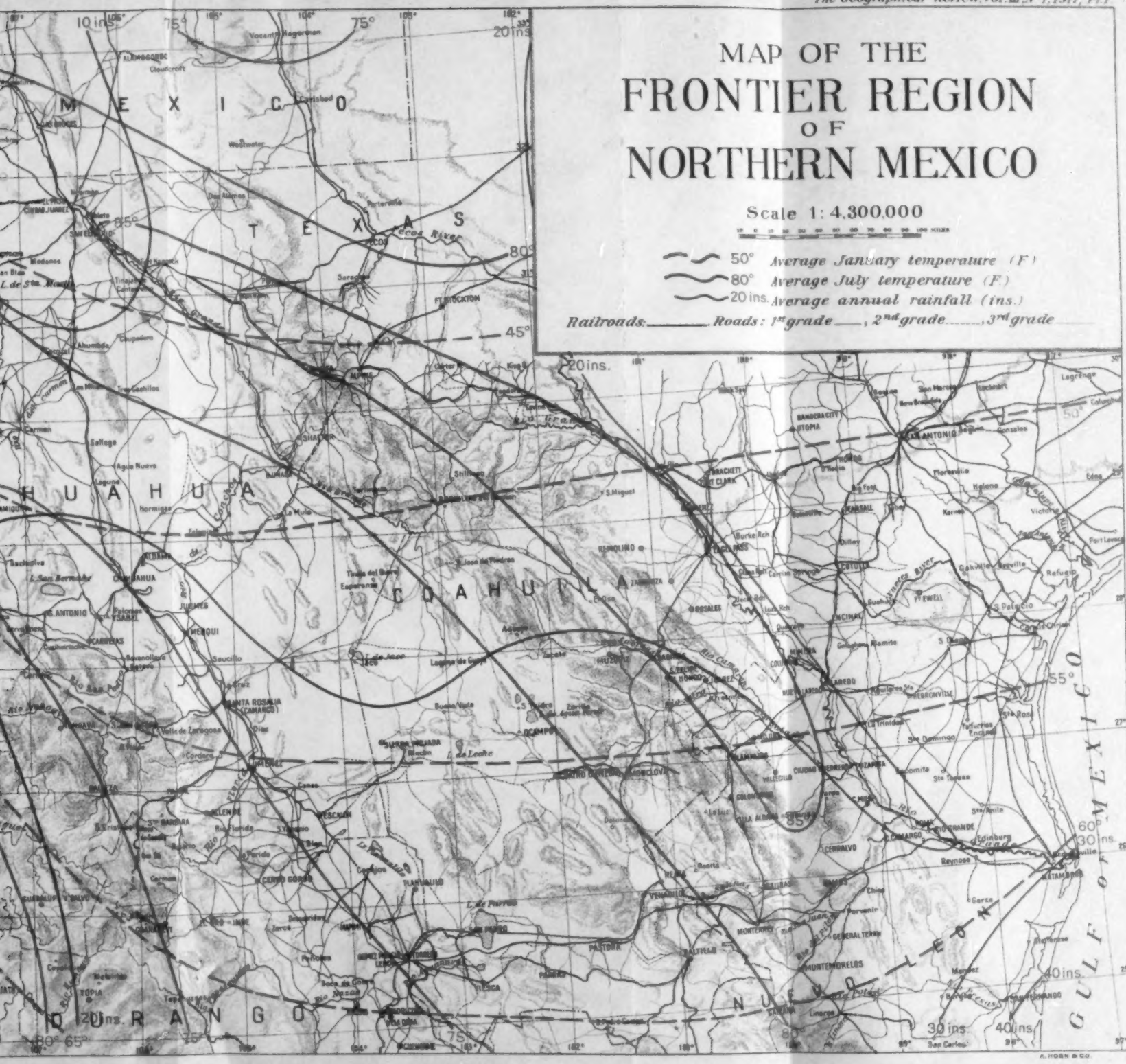
FIG. 5—Sketch map of Mexico showing the relation of the cities to the plateau. Scale, 1:26,000,000.

Saltillo (35,063), near it, is on the plateau, but this the rebels have gone by for the fighting near San Luis Potosí. Torreon is a small place. The population has not yet been reported for 1910, but ten years ago it was 13,800. The *area* held by the rebels is very large, perhaps a third of Mexican territory, but a great deal of it is uninhabited, with certainly less than one and a half of Mexico's fifteen million people, a bare tenth of the population. The task of the rebels is thus still mainly ahead of them.

"The cities of forty thousand (the squares on the map), are, from north to south: Chihuahua (39,061), Saltillo (35,063), Aguas Calientes (44,800), Guanajuato (35,147), Querétaro (35,011), Pachuca (38,620); then west of Mexico City, Morelia (39,160), close to the capital, Tacubaya (35,830), and, toward Vera Cruz, Orizaba (36,189). Oaxaca (37,469)

CALIFORNIA
ARIZONA
NEW
SONORA
CHIH
BAJA CALIFORNIA
GULF OF CALIFORNIA
PACIFIC OCEAN
10 ins.
20 ins.
50°
55°
60°
65°
75°
80°
85°
Yuma
Tucson
Nogales
Hermosillo
Guaymas
Obregon
Navojoa
Mulege
Loreto
La Paz
Ensenada
Mexicali
Chihuahua
Culiacan
Mazatlan
Topolobampo
Los Mochis
Guerrero Negro
Cabo San Lucas
Cerralvo I.
Tiburon I.
Angel de la Guarda I.
Salsipuedes I.
Carmen I.
Santa Rosalia
Puerto Libertad
Puerto Penasco
Bahia de los Angeles
Bahia de la Concepcion
Bahia de Ballenas
Bahia de Magdalena
Bahia de Santa Maria
Bahia de Todos Santos
Bahia de Sebastian Vizcaino
Bahia de Soledad
Bahia de Santa Rosalia
Bahia de Concepcion
Bahia de Loreto
Bahia de La Paz
Bahia de Ventana
Bahia de Topolobampo
Bahia de Navachiste
Bahia de Santa Maria
Bahia de Altata
Bahia de Mazatlan
Bahia de Banderas
Bahia de Matanchel
Bahia de Chamela
Bahia de Manzanillo
Bahia de Acapulco
Bahia de Zihuatanejo
Bahia de Petacalco
Bahia de Huatulco
Bahia de Tehuantepec
Bahia de Chiapas
Bahia de Soconusco
Bahia de Acapetahua
Bahia de Chantuto
Bahia de Paredon
Bahia de Chiapa
Bahia de Tonala
Bahia de Mapastepec
Bahia de Pijijiapan
Bahia de Tapachula
Bahia de Puerto Madero
Bahia de Chiapa
Bahia de Tonala
Bahia de Mapastepec
Bahia de Pijijiapan
Bahia de Tapachula
Bahia de Puerto Madero

C.RRISCH DEL.


MAP OF THE
FRONTIER REGION
OF
NORTHERN MEXICO
Scale 1: 4,300,000
50° Average January temperature (F.)
80° Average July temperature (F.)
20 ins. Average annual rainfall (ins.)
Railroads. Roads: 1st grade, 2nd grade, 3rd grade
MEXICO
TEXAS
CHIHUAHUA
COAHUILA
NUEVO LEON
DURANGO
GULF OF MEXICO
Rio Grande
Pecos River
Nueces River
SAN ANTONIO
EAGLE PASS
LAREDO
MONTERREY
SALTILLO
PIEDRAS NEGRAS
MATAMOROS
20 ins.
30 ins.
40 ins.
A. HORN & CO.

stands isolated on a five-thousand-foot upland of its own farther south. The cities of thirty thousand (triangles) are: on the plateau southwest of Torreon, Durango (34,085); southeast of it, Zacatecas (25,905); near the capital, Toluca (31,247); and on lower ground nearer the west coast, Colima (25,148).

"Close beside each city symbol is a little number giving its elevation in hundreds of meters. These figures show that the larger cities are on higher ground near the southern end of the plateau about Mexico City, at elevations of seven or eight thousand feet. The heart of Mexico is now as always most vulnerable from Vera Cruz, on account of the nearness of the thickly settled regions to the sea in that neighborhood, though the ascent is steepest there and the low ground to be passed through most unwholesome."

At the request of this Society, Professor Jefferson has supplemented his former comments with the following paragraphs:

"The Mexican situation at the present, December, 1916, is quite different from that of the spring of 1914; but the scene of action is the same portion of the Mexican Republic, the thinly settled, desertic, and arid north. Even a strong government would have trouble maintaining order in a region so poor in food and water, where the only thing that abounds is empty space. Given a desperate insurgent who is inured to hunger and thirst, in such a region he finds his best theater of operations.

"Turkey finds the problem of Arabia equally difficult, and has always found it so, for the geographic obstacles are the same. If the United States undertakes the pacification of northern Mexico she will have the same difficulties to solve. American troops may be trained to ride like Mexicans, to find their way and fight in the desert like them, but they cannot hope to match them in *doing without*, an art in which the Mexican has a life-long training, and the American none. For this reason the problem of reducing northern Mexico will involve supply trains that will be costly out of all proportion to the numbers involved. It will not be comparable to the former Mexican war, which was a war with a government established in the heart of Mexico and attacked there."

A Selected Bibliography of Geographic Material on Mexico

General Works

C. R. Enock: Mexico: Its Ancient and Modern Civilisation, History and Political Conditions, Topography and Natural Resources, Industries and General Development. T. F. Unwin, London, 1909.

P. F. Martin: Mexico of the Twentieth Century. 2 vols. Edwin Arnold, London, 1907.

N. O. Winter: Mexico and Her People of Today. Page and Co., Boston, 1907.

Prince Roland Bonaparte, Léon Bourgeois, Jules Claretie, d'Estournelles de Constant, A. de Foville, Hippolyte Comot, O. Gréard, Albin Haller, Camille

KRANTZ, MICHEL LAGRAVE, LOUIS DE LAUNAY, P. LEROY-BEAULIEU, E. LEVASSEUR, General NIOX, ALFRED PICARD, ELISÉE RECLUS: Le Mexique au Début du XXe Siècle. 2 vols. C. Delagrave, Paris, 1904.

MATIAS ROMERO: Geographical and Statistical Notes on Mexico. G. P. Putnam's Sons, New York, 1898. [Expanded from a paper in *Bull. Amer. Geogr. Soc.*, Vol. 28, 1896, pp. 327-386.]

MATIAS ROMERO: Mexico and the United States: A Study of Subjects Affecting Their Political, Commercial, and Social Relations, Made with a View to Their Promotion. G. P. Putnam's Sons, New York, 1898. [Both books by Romero have long been standard works of reference. The second contains a reprint of the first.]

—— The Mexican Year Book: A Financial and Commercial Handbook, Compiled from Official and Other Returns. Issued under the auspices of the Department of Finance, Mexico City, New York, and London. [Since 1906: contains material brought up to date.]

—— *Commerce Reports* (formerly *Daily Trade Reports*). Bureau of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C. [Source of much useful information, as for example the note on irrigation and farming in the Imperial Valley of northern Lower California, *Daily Consular and Trade Repts.*, No. 192, 1913.]

Mexico in Relation to Revolutions

H. H. BANCROFT: History of the Mexican People, Being a Popular History of the Mexican People from the Earliest Primitive Civilization to the Present Time. The Bancroft Co., New York, 1914. [On p. 348 is a map showing the areas occupied by the revolutionists in 1813. They were concentrated in the remote districts of the south.]

L. GUTIERREZ DE LARA AND EDGCUMB PINCHON: The Mexican People: Their Struggle for Freedom. Doubleday-Page Co., Garden City, N. Y., 1914. [Discussion of the agrarian policy under Diaz is accompanied by a map showing localities where peasant-farmers were dispossessed of their lands.]

CARLO DE FORNARO: Carranza and Mexico. With chapters by I. C. Enriquez, Charles Perguson, and M. C. Rolland. Mitchell Kennerley, New York, 1915. [One of the most interesting features of this "inside view" of Mexico is the map showing the strategic railroad lines (p. 114).]

Geography of Northern Mexico

DILLON WALLACE: Beyond the Mexican Sierras. A. C. McClurg Co., Chicago, 1910. [A well-written account of the author's travels in the trans-Sierra country between the states of Sonora and Jalisco.]

E. C. HOVEY: The Western Sierra Madre of the State of Chihuahua, Mexico. *Bull. Amer. Geogr. Soc.*, Vol. 37, 1905, pp. 531-543. [Topographic barriers to communication are well illustrated in this article.]

O. H. HOWARTH: The Western Sierra Madre of Mexico. *Geogr. Journ.*, Vol. 6, 1895, pp. 422-437. [A concise geographical study.]

CARL LUMHOLTZ: New Trails in Mexico: An Account of One Year's Exploration in Northwestern Sonora, Mexico, and Southwestern Arizona, 1909-1910. Charles Scribner's Sons, New York, 1912. [An invaluable study in the human geography of the region "formerly called Papagueria." A summary account may be found in the author's article "The Sonora Desert, Mexico," *Geogr. Journ.*, Vol. 40, 1912. The article is followed by notes on the same region by I. N. Dracopoli.]

D. T. MACDOUGAL: Across Papagueria. *Bull. Amer. Geogr. Soc.*, Vol. 40, 1908, pp. 705-725. [A brief narration of the itinerary from oasis to oasis of the expedition de-

spatched from the Carnegie Institution Desert Laboratory at Tucson, Arizona. The main features of the vegetation are also outlined. A detailed study of the vegetation of this and other desert areas from the Great Basin in Nevada to southern Mexico is offered by D. T. MacDougal's "Botanical Features of North American Deserts" (*Carnegie Inst. Publs. No. 99*, 1908). An important recent paper is Forrest Shreve's "The Vegetation of a Desert Mountain Range as Conditioned by Climatic Factors" (*Carnegie Inst. Publs. No. 217*, 1915). It describes the Santa Catalina Mountains north of Tucson.]

E. A. MEARNS: Mammals of the Mexican Boundary of the United States: A Descriptive Catalogue of the Species of Mammals Occurring in that Region, with a General Summary of the Natural History and a List of Trees, *Bull. U. S. Natl. Museum No. 56*, Part I. Washington, D. C., 1907.

W J MCGEE: The Seri Indians. *17th Ann. Rept. Bureau of Amer. Ethnol.*, 1895-1896, Pt. I, pp. 1-344* (duplicate pagination). [Standard ethnographical description of the Indians inhabiting Tiburon Island in the Gulf of California and a limited area of the opposite shore of the state of Sonora.]

W J MCGEE and WILLARD D. JOHNSON: Seriland. *Natl. Geogr. Mag.*, Vol. 7, 1896, pp. 125-133. [Based on the preceding.]

Boundary Surveys

W. H. EMORY: Report on the United States and Mexican Boundary Survey, made under the direction of the Secretary of the Interior. 2 vols., Washington, D. C., 1857-58; also as *34th Congr., 1st Session, Senate Doc. 108* and *House Doc. 135*. [Contains detailed narrative by Emory and reports on the geology and physical geography of the boundary region by C. C. Parry and Arthur Schott. Accompanied by a map in 4 sheets on the scale of 1:600,000.]

—— Proceedings of the International (Water) Boundary Commission, United States and Mexico, Treaties of 1884 and 1889: Equitable Distribution of the Waters of the Rio Grande. 2 vols. State Department, Washington, D. C., 1903. [Contains a detailed map (1:10,000) in 54 sheets of the coastal plain segment of the Rio Grande, showing the shifting of the channel since 1853.]

—— Report of the Boundary Commission upon the Survey and Re-Marking of the Boundary between the United States and Mexico west of the Rio Grande, 1891 to 1896. 3 vols. (i. e. text, album of views, and atlas). State Department, Washington, D. C., 1898. [The atlas contains 18 sheets on the scale of 1:60,000, covering the boundary from El Paso to the Pacific.]

CENTRAL ENGLAND DURING THE NINETEENTH CENTURY: THE BREAK-DOWN OF INDUSTRIAL ISOLATION

By B. C. WALLIS

"Man's reaction to his environment" defines summarily the subject-matter of the science of geography, and it is the purpose of this paper to demonstrate certain aspects of the reaction which has occurred in a certain area of central England (indicated in Fig. 1). The backbone of England, the Pennine upland, is terminated to the south by the sweep of the valley of the Trent, which rises near the boundary of the county of Cheshire, crosses the counties of Stafford, Derby, and Nottingham, and finally emerges into the Humber. The area under examination includes the southern portion of these Pennine hills, the Trent valley, and the lowlands which fringe the Pennines both to the east and to the west. For convenience of investigation the area is that of the counties of Nottingham, Derby, and Cheshire as well as the northern portion of Staffordshire. This area is not a geographical region, since it includes portions of both eastern and western England; it is not a definite geographical unit, since the variety of its minerals has given rise to various conditions of life. Although it forms a part of the area to which the name "industrial Britain" has been applied, it cannot be regarded as a typically industrial area, since there are many farmers within its boundaries. The district is a connecting link, an area of transition, which lies between the great textile areas of Lancashire and the West Riding of Yorkshire and the great iron area centered upon Birmingham, the "black country." Such an intermediate area will probably serve better for the purposes of a geographical investigation than a geographical region, or a typically industrial district, since it will continually enforce comparisons between, for example, the effects of coal and salt, or between the lives of farmers and factory hands.

The investigation covers the period of the nineteenth century, since the complete inquiry deals with changes which have occurred within a definite period of time, and since the nineteenth century has many conveniences when considered as a period of change.

The people who inhabit the district are largely native to the area; statistics of migration tend to show that there has been some influx of people from other parts of England but that there has also been a greater outflow from this area both to other parts of England and to other countries, so that it may be concluded that, on the whole, the changes which have occurred within the area are confined to the natives of the district.

The factors in the environment within which these people have lived may be considered under two heads: as static and as dynamic. It should be

remembered, however, that although the static elements, such as relief, climate, and rock-structure, are not constant but cumulative in their effect, yet they may be called static since they are always present, although their relative importance is always changing. The dynamic factors in the environment are due to human activities within the area during previous periods and without the area both during the period under consideration and during earlier years.

Static Factors in the Environment of the Population

Relief. The core of the district is that portion of the Southern Pennines which culminates in the Peak, 2088 feet, and which forms the northern portion of Derbyshire, with a minimum elevation of 1000 feet, above which detached portions rise to a height not exceeding 2000 feet (see Fig. 1). Southwards, long narrow valleys, Dovedale and Derwentdale, contain tributaries of the Trent. These valleys are justly famed for their scenery. A projection from the main uplands is continued eastwards to form the low hills of western Nottinghamshire, where the relics of Sherwood Forest make the Dukeries a district whose sylvan beauties attract many tourists. Usually, however, the uplands drop suddenly to the plains which stretch eastwards and westwards at a level lower than 300 feet, yet with a diversity of relief due to valley and knoll which gives considerable variety to the landscape. The eastern plain contains the tributaries of the Trent, and the western, the Cheshire Plain, is diversified by the streams which reach the Weaver, the Dee, and the Mersey. The whole area, therefore, presents the contrast of upland and plain, in which the difference in elevation is greater than that which is encountered elsewhere in England, except farther north.

Rock-Structure. The uplands of northern Derbyshire consist of Carboniferous limestone flanked on the east and northwest by narrow bands of millstone grit: these form the Lower Carboniferous rocks of Figure 2. Almost entirely along the western and quite along the eastern edge of these rocks lie the Coal Measures, and beyond these are the lower heights and the plains, where the rocks are chiefly Keuper marls and sandstones with specimens of Bunter sandstone in western Nottinghamshire and western Cheshire. The Robin Hood Hills of Nottinghamshire are a Bunter formation, but the knolls of Cheshire are Keuper sandstone. The scenic beauties of northern Derbyshire are due to the Carboniferous or mountain limestone, which accounts for the gorges of the Dove and Derwent. The sylvan glories of the lower hills, Sherwood Forest, and Delamere Forest in Cheshire are due to the sandstones. The mountain limestone yields ores of lead, zinc, and copper; the Keuper marl gives quantities of rock-salt.

Rainfall. In a small area such as this, with so small a variation in elevation, the chief climatic factor is the rainfall. It may be noted, however, as one of the causes of the difference in rainfall between the eastern and western plains that the eastern plain is several degrees colder during the winter

than the western plain, in consequence of the fact that the winter anticyclonic conditions tend to spread from the continent over Nottinghamshire more frequently than over Cheshire, and that therefore the winter months in the east tend to be drier.

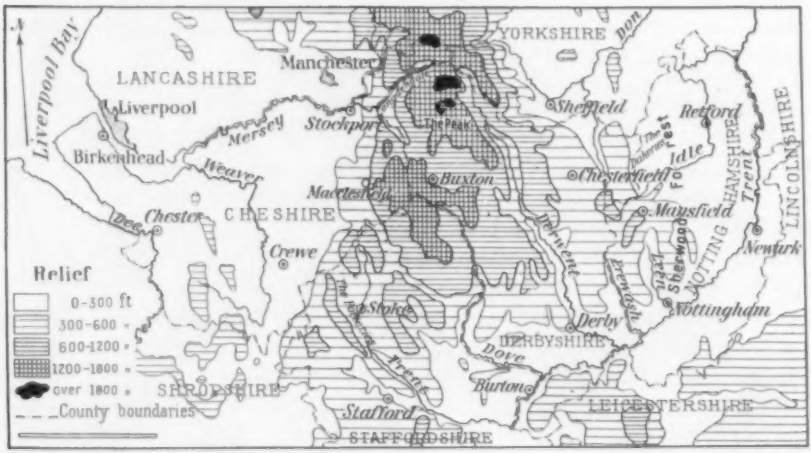


FIG. 1—The Southern Pennines: Relief.
Note. The line in the lower left corner of Figs. 1 to 3 represents a distance of 20 miles.

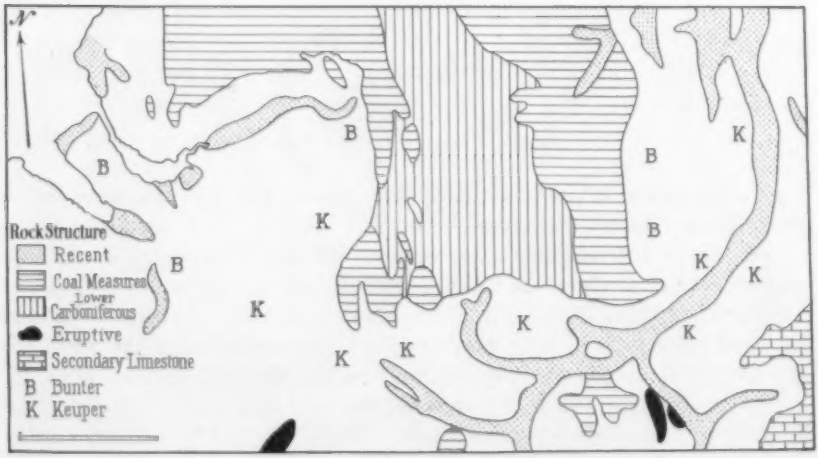


FIG. 2—The Southern Pennines: Rock-structure.

The distribution of the total annual precipitation is indicated in Figure 3, where it may be seen that the higher the land the heavier the total annual rainfall, while the eastern plains are drier than the western plains. The 30-inch isohyet on the east of the uplands tends to coincide with the 500-foot

contour, while on the west the 500-foot contour is close to the 40-inch isohyet.

But the most important fact regarding the rainfall of this district lies in the effect of the prevalent warm winter conditions upon the hills, especially upon their western slopes. During the winter the hills are very much wetter than the plains, and during the summer the plains are very much wetter than the hills; the word *wet* in this connection being used in a special sense with reference not to the total fall of rain but to the percentage of the total annual fall which occurs during the periods named. The hills have a large proportion of their rain in the winter, so that it appears probable that the excess rainfall upon the hills in comparison with that upon the plains is

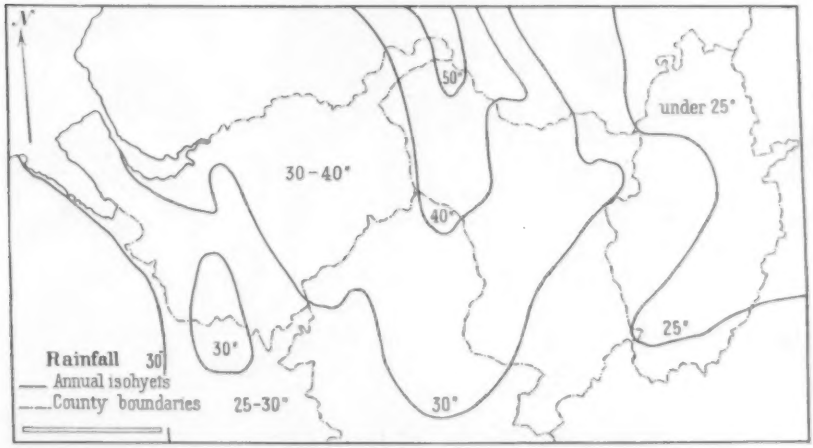


FIG. 3—The Southern Pennines: Rainfall.

due to an amount of precipitation during the winter which is superposed on the hills only during that season.

One other difference is of importance. In the Trent valley in Nottinghamshire there is a probability of specially heavy rain splashes during the months of June and July, with the inevitable consequence that the farm-land near the river is frequently flooded during the period when the crops are ripening. The total precipitation suffices for the hill streams, many of which have been, and some of which still are, used as sources of water power.

To some degree the Cheshire lowland shares in the noteworthy humidity of the atmosphere which is characteristic of the Lancashire plain farther to the north.[1] This humidity is of especial value in connection with those val-

[1] For a fuller examination of the rainfall conditions of the Southern Pennines in relation to the monthly variations in intensity, with particular reference to the areas where the cotton factories are most numerous, the reader may be referred to a paper by the writer on "The Rainfall of the Southern Pennines," published in the *Quart. Journ. of the Roy. Meteorolog. Soc.*, Vol. 40, 1914, pp. 311-322 (discussion, pp. 322-326).

leys, such as Longdendale, which open out facing the southwest; since the moist air is, as it were, forced into a steadily narrowing gap which increases the percentage of moisture in the air. In this respect Longdendale will necessarily have a more humid atmosphere than Derwentdale, which slowly opens out towards the southeast.

Changes in the Distribution of the Population

The accompanying maps (Figs. 4-6) which show the density of the population are based upon the Census reports of England. The areas which have been considered are the smallest administrative units, the parishes, and the three maps, here published, are typical of the manuscript maps

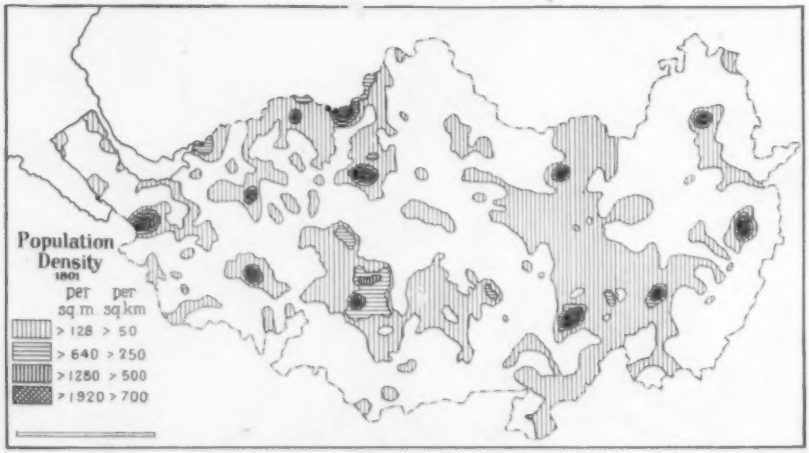


Fig. 4—Density of the population in 1801.
Note. The line in the lower left corner of Figs. 4 to 6 represents a distance of 20 miles.

which have been made for each of the eleven census years beginning at 1801 and ending with 1901. They present three stages in a gradual change, in some areas progressive and elsewhere retrogressive, which has been operative throughout the century.

The population lines which are drawn upon the maps embody the same principle as that which is utilized in the mapping of contours and of climatic lines such as isotherms. The density value for each parish was entered upon a map and the numbers so entered were treated in the same fashion as "spot heights" in the drawing of contours.[2]

In 1801, the district was relatively scantily peopled (Fig. 4). More than half the area contained fewer people than 128 per square mile. There were nuclei of people in the towns which are strung along the Trent valley,

[2] For a discussion of various methods of representing population values upon maps, the reader may be referred to a paper by the writer on "Distribution of Nationalities in Hungary," which was published in the *Geogr. Journ.* for March, 1916.

Stoke, Derby, Nottingham, Newark, and Retford. Along the south bank of the Mersey were Stockport, Altrincham, and Runcorn. The ancient town of Chester was a crowded place, and there were isolated urban areas at Nantwich, Northwich, Macclesfield, and Chesterfield. In most cases the

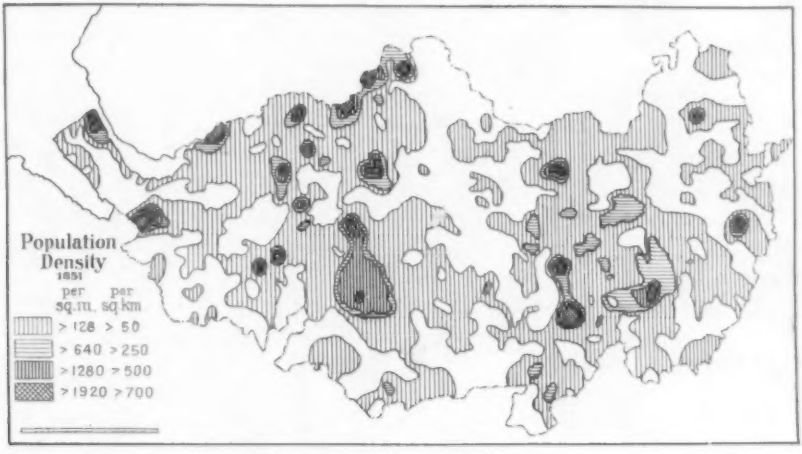


FIG. 5—Density of the population in 1851.

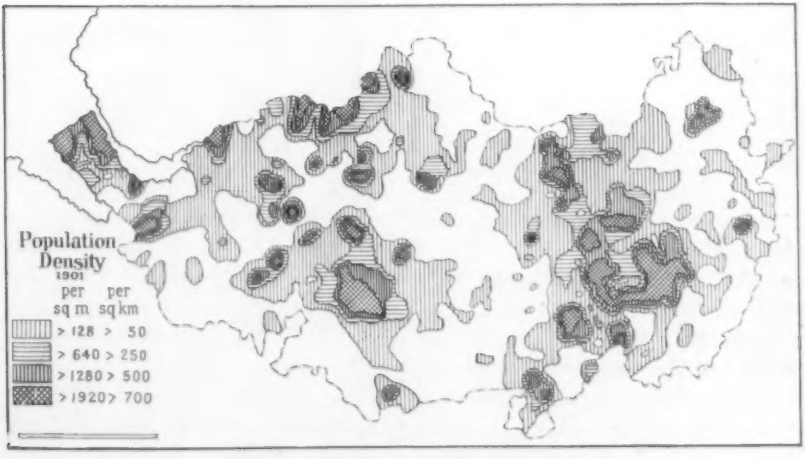


FIG. 6—Density of the population in 1901.

change from urban to rural proportions was rapid; the single exception was to be found in the Potteries round Stoke. The rural population tended to be most dense in certain definite directions, along the Trent valley, northwards along the Erewash valley, past Chesterfield in the direction of Shef-

field, towards the Potteries from Stockport through Macclesfield, and slightly away from the Mersey from Stockport towards Chester.

The distribution in 1851 (Fig. 5) resembled that of 1801 except that the areas of higher population had tended to spread and in some cases had coalesced. The Potteries area had grown to include Congleton, the Stockport area had spread eastwards to include Glossop in Longdendale, the Derby area had spread up the Derwent valley to include Belper, the Nottingham area had grown to include Ilkeston. Newark and Chester, towns of relatively great age, grew but little. Birkenhead had become important in consequence of the establishment of ferry communication across the Mersey estuary with Liverpool. The rural areas show little more than the natural increase of an agricultural population which remained attached to the villages. The map indicates that there had been relatively little migration from the rural to the urban areas, since the urban areas are still relatively small in comparison with the area of the whole district.

By the end of the century there had occurred great changes (Fig. 6). In the first place, the rural areas now contained, on the whole, fewer people than in 1801; there had been a migration out of the country districts which had exceeded in numbers the natural increase of the population during half a century; in some districts the population was sparser than in 1801. In those areas, every 100 persons in 1801 should have increased during the century to 300 at least, yet, in fact, they had decreased in some cases to about 75. The urban areas had grown denser and larger. The most striking urban increase occurred between Ilkeston and Chesterfield and both east and west from Stockport. Birkenhead had grown larger as a town of increased shipping with new docks and ship-yards and also as a dormitory for Liverpool. There had occurred a distinct shifting of the mass of the people; the decline in population in the area which occupies the center of the map is notable.

It may be well to try and picture a rural scene, such as has maintained almost an unchanged distribution of population during the century. A cluster of small houses nestles near the church, and farmyards are separated only by a brick wall from God's acre. Outwards, in all directions, the small fields with typically English hedgerows; here and there, dotted over a landscape with gentle undulations, an isolated farm. With a slight turn of the head the eye sweeps over an area of about fifty square miles, and if one counts the cottages and farms they will not number a hundred. Somewhere close by is a main road, often dating back like Watling Street or the Fosse Way to Roman times; centering on the tiny village are the minor roads. Nowadays the main roads are used by travelers who sweep along in speedy motors, the minor roads are traversed by farm wagons, by the carts of the butcher and the baker, or by vans which deliver commodities from the nearest large town. Such a scene is typical over the major portion of the country. There are subtle differences in Cheshire; trees line the fields,

and coppices and spinneys are more frequent; nearer the high ground, hedges give place to stone walls; in the east, ploughed land or growing crops take the place of the commoner pasture land in the west.

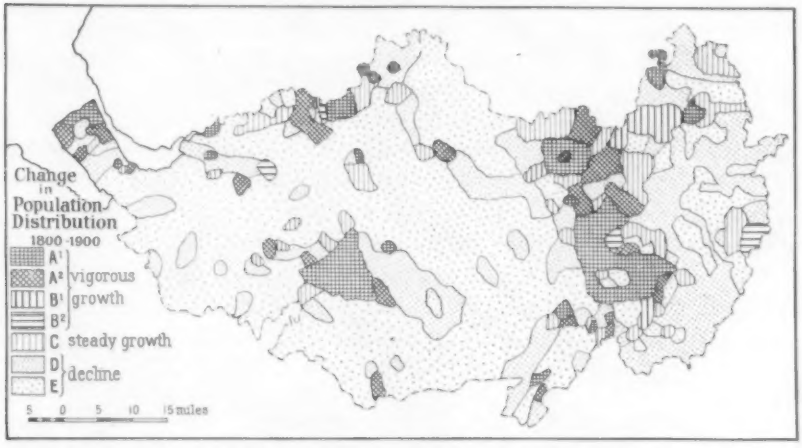


FIG. 7—Changes in the distribution of the population during the nineteenth century.

The changes which occurred during the century are summarized in Figure 7. The district is divided into five types, wherein the changes had occurred that are indicated by the graphs in Figure 8. In the areas of group C the rate of change of the population had been steady and equivalent to the average for England as a whole; the population had trebled itself. These parishes are scattered and small in total area. The people indicated in group D were proportionately as numerous in 1901 as in 1801; the areas so indicated had seen an increase in density during the first half century and an almost equal decline during the second half century. Such areas are particularly large in the county of Nottingham. The largest areas are those of group E, where the population had declined in numbers, especially since 1851.

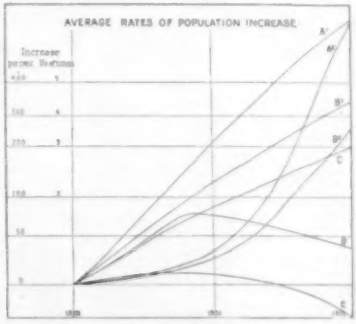


FIG. 8—Average rates of increase of the population. (The symbols correspond with those on Fig. 7; for their precise meaning, see the text.)

Groups A and B contain those parishes where the population had multiplied five and four times respectively; in some of the parishes (groups A^1 and B^1) the rate of increase had been steady and continuous throughout the century; in the others (groups A^2 and B^2) the growth occurred almost

entirely during the second fifty years. Figure 7 indicates the great importance of the district between Ilkeston and Chesterfield, the great growth of the compact area of the Potteries, the expansion of Stockport, and the rise of Birkenhead. Maximum progress of this type becomes evident to the traveler by the continuity of the brick buildings—houses and factories—which line the roads and tend to fill in the intervening spaces. It ends eventually in an amalgamation of townships such as the recent combination of Hanley, Stoke, Burslem, etc., into the single town of Stoke—the "Five Towns" of Mr. Arnold Bennett's novels. It is manifest by the difficulty which is experienced in determining where Stockport, say, ends and Hazelgrove begins.

The First Half-Century

The industrial revolution of the later years of the eighteenth century had given life in northern England a definite stimulus towards the growth

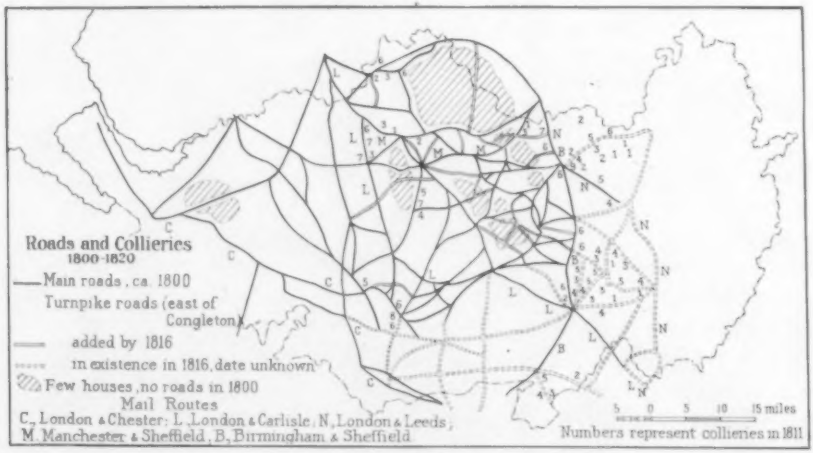

Roads and Collieries
1800-1820
Main roads, ca. 1800
Turnpike roads (east of Congleton)
added by 1816
in existence in 1816, date unknown
Few houses, no roads in 1800
Mail Routes
C., London & Chester; L., London & Carlisle; N., London & Leeds;
M., Manchester & Sheffield; B., Birmingham & Sheffield
5 0 5 10 15 miles
Numbers represent collieries in 1811

Fig. 9—Roads and collieries, 1800-1820 A.D.

of manufactures, and the first fifty years of the nineteenth century were, therefore, a period of experiment and adjustment.

Again and again factories were established, operated for some years, and finally closed as failures; these were typical experiments by which the northerner tested the possibilities of his environment. The needs of the increasing number of factory hands caused the farmers to alter gradually the basis of their agriculture, and the requirements of industry occasioned developments in transport, inventions of new machinery, a greater need for coal; and life within this area only gradually adjusted itself to these changing conditions. The old records are in many cases scanty, and those which are available are not of uniform excellence; it will suffice to specify two examples. In 1795, Dr. John Aikin published "A Description of the

Country from thirty to forty miles round Manchester" which is of surpassing importance on account of the valuable facts which are recorded and also because of the map which illustrated the text. During the first decade of the century the Board of Agriculture published reports upon the agriculture of the various counties, and of these Farey's account of Derbyshire excels the rest in consequence of its thoroughness and of its maps. Figures 9 and 10 are based largely upon these two sources of information, and they betray, at once, the lack of uniformity which exists in the old records. On this account it will probably be wise to consider the first half-century in general for the whole area and to devote attention during the second half-century to the major lines of development and decay. This plan has especial merit, since the population as a rule progressed generally and uniformly during the period 1801-1851 (Figs. 4 and 5).

During these years the bulk of the population depended upon the land;

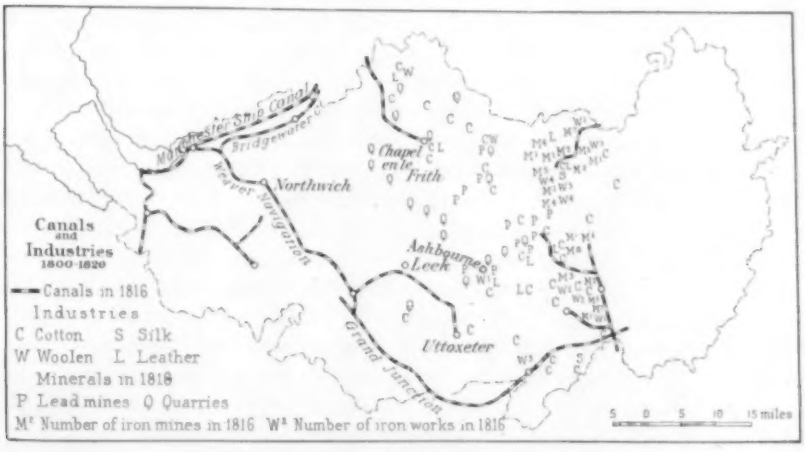


FIG. 10—Canals and industries, 1800-1820 A.D.

they were interested in the farms, which stretched over the whole of the area, except the limestone and gritstone moors of Derbyshire and the sandstone forested areas such as Delamere. (Figure 9 shows the patches with few houses and roads.) On the Cheshire side the view from the edge of a scarp such as that of Macclesfield lay over a countryside which presented the appearance of dense woods, but this appearance was deceptive, for there were few woods. The fields were small, they were bordered by hedgerows, with frequent and fairly large spinneys which were sufficiently numerous to give the impression of continuous woodland. On the uplands lay the stone-wall country where the farm-lands were bounded by stone walls instead of hedgerows. Southwards lay the flat lands of the Trent, which were continued eastward in more open farm-land with numerous meadows near the

river and the tributary streams. All the lowland farm-land contained a stiffish clayey soil, above the Keuper, lightened wherever the farmer had adopted the practice of marling, for the marl pits where the sub-stratum of the Keuper marl had been reached were common to many farms. In consequence of the greater rainfall of the west, pastures were more frequent in Cheshire and Staffordshire than in Nottinghamshire, with the result that oats and milk and cheese, with an increasing acreage under potatoes, characterized the western farms, while barley and wheat and flocks of sheep mark the drier eastern lands. Throughout Cheshire oats were ground into meal and formed the staff of life for the poorer people. Along the south side of the Mersey potatoes were grown and sent to Manchester and Liverpool for sale. Near Nantwich and along the upper Trent the manufacture of cheese was important during the early years; some was sent by sea from Chester and Frodsham to London and the rest was sent by road to Lancashire and Yorkshire. Agents visited the farms in Derbyshire in August and bought the cheese for the London market; most of it was transported by sea from the east coast port after a river journey down the Trent. With the advent of the railways the milk trade with the towns of southern Lancashire caused a decline in the production of cheese, but the pastures were still necessary for the store beasts which were brought into the district from the north and fattened for the butcher. The lower-class farmers rarely ate fresh meat, but the greater wealth of the factory operatives gradually led to a growing trade in meat. Dovedale was notable for its cattle. These facts kept the Cheshire farms small and intensified the need for farm laborers, which gave rise to the developments in the rural population shown in Figure 5. Intensive farming of this nature implies the use of manures, and lime was taken from the quarries at Chapel-en-le-Frith over the roads on the backs of small Welsh ponies for the farmers in Longdendale.

In Cheshire over 90 per cent of the land was farmed, and three-quarters of the farm-land was under grass. The spinneys provided oak bark and the cattle provided hides, so that Nantwich and Newcastle, for example, made shoes and leather bands for the machines of the factories. Before the days of railways milk was sent to the centers of population from the surrounding farms in barrels slung on the backs of asses or ponies. In Staffordshire two-thirds of the farms were under grass, and both in Staffordshire and western Derbyshire much barley was grown for the brewers at Burton.

The countryside, therefore, consisted largely of farm-land based upon the valley lowlands, crossed by the main roads, which were linked together by numerous dirt lanes. The cottages bordered the lanes, and the farm houses lay back among the fields. Only in the wealthier districts had the use of bricks and tiles begun to improve the appearance of the cottages, so that a contemporary writer could still describe a waterside village not

far from Chester as a "specimen of pure barbarism." Most of the main roads were in use for through traffic for the mail-coaches, and many of the purely agricultural townships such as Nantwich, Newark, and Retford owed much of their importance and wealth to the traffic which passed along the roads.

There were four areas notable for extractive industries. In the Weaver valley salt was obtained. The salt traffic had begun to concentrate upon Northwich and had affected Frodsham and Runcorn favorably. Some 50,000 tons per annum were exported to Ireland for curing provisions, and to Dunkirk, Ostend, Bruges, Riga, and Elsinore. This salt passed to Liverpool by the Weaver Navigation and thence as ballast in out-going ships. The evaporating pans were now made of wrought iron, and the coal necessary for fuel was supplied from Lancashire as a return cargo for the river boats.

Coal was mined east of the Pennines, in the Coal Measures which flank the upland continuously. Almost from Derby to Nottingham and in the north round Chesterfield collieries were numerous, and in this district ironstone was also largely obtained. On most of the upland between Macclesfield and Stockport and in Staffordshire near Cheadle and in Derbyshire south of Burton there were small groups of pits. Much of the coal was used locally, yet some was sent short distances by pack-pony and by canal from southern Derbyshire to Leicestershire, and from Chesterfield to the counties of Nottingham and Lincoln, by way of the river navigation which began at Bawtry on the Idle. In the mountain limestone were lead mines, which were, at that early date, much troubled by in-flowing water, which was removed by hand-, horse-, and steam pumps. At Wirksworth lead was smelted and sent to London via Bawtry.

Limestone was quarried at various places, while saw-mills for making paving stones were worked, by water wheels, at Bonsal and Cromford, and, by steam, at Mansfield and Wirksworth.

As early as 1811 it was noticed that the exhaustion of lead mines caused a decrease in the number of houses at Tideswell and Moneyash.

The district contains three centers of industry: the Potteries, the attenuated line of cotton factories which stretched from Stockport across to Derwentdale and down the valley to Belper, and the iron works of eastern Derbyshire, both north and south.

In regard to cotton factories it must be noted that the great work of Arkwright was carried out in Derbyshire; during the later years of the eighteenth century cotton spinning mills were built at Cromford by Arkwright, at Belper and Milpond by his associate, Strutt, while others were erected at Glossop; by the beginning of the nineteenth century there were 37 mills in Derbyshire. In 1788, out of 123 water-mills engaged in the cotton trade in England, 22 were in Derbyshire, 8 in Cheshire, and 7 in Staffordshire. The driving force being water-power, the mills were situ-

ated up the valleys of Longdendale and Derwentdale; the first application of steam power to these mills consisted in the use of steam pumps to supply water for overshot water-wheels. Hand knitting of stockings was a common domestic industry, especially in the district between Derby and Nottingham. The invention of a rib machine caused a gradual localization of the stocking industry in factories situated in this district, of which Nottingham became the chief center. At Stockport, Aikin notes 23 cotton factories, four of which had steam engines. The combined use of water and steam for power lasted well into the century, for at Quarry Bank near Stockport a mill was built in 1877, partly driven by water. This mill, like others which had previously been in operation at Wilmslow in the neighborhood, failed. Farther south, near Macclesfield, the early mills based upon water-power one by one ceased work as the century grew older.

In Longdendale the cotton mills steadily increased in number; by 1820 at least 50 were hives of industry in the Glossop district, and these formed half the total number at work in Derbyshire. The factories were not limited to the spinning of cotton, since calico, muslin, and cambric were woven and there were four factories each engaged in calico printing, bleaching, and dyeing. In Staffordshire there were mills about 1820 at Rocester and Burton. Aikin notes that just before the century opened about 23,000,000 pounds of cotton were imported, about two-thirds of which came from the West Indies, and about half of which was used in the manufacture of calico and muslin, and that the total value of cotton goods made was about eight millions sterling. From other sources it may be estimated that the average imports of cotton in 1800, 1810, and thence by decades to 1850 were respectively, in million pounds, 50, 100, 140, 250, 500, and 725. This development coincided with the introduction of steam power, the development of the coal fields, the use of railways, and a great concentration of the cotton mills towards the towns, in which they are most numerous at the present time.

The Potteries were a collection of villages which lay roughly along the outcrop of quick-burning coals and clays suitable for the manufacture of earthenware. The district and the staple industry had already received a stimulus from the work of Wedgewood, but was handicapped by difficulties of transport, since the roads were bad and the pots had to be carried on the backs of pack mules for many miles. Newcastle, a residential town where boots and shoes were made, lay to the west of the Potteries, which centered upon Burslem, Hanley, Stoke—where the first steam engine had been set up by Spode to grind burned flint for the use of the potters—Etruria, Longport, Lane End (later called Longton), Cobridge, and Shelton.

In connection with the manufacture of iron goods Derbyshire in 1806 was the fourth county in importance in the United Kingdom. There were, in all, 18 furnaces with an annual production of 10,000 tons of pig iron.

Twelve furnaces were in blast and each had approximately the same annual output.

The first half century is notable on account of the changes which occurred in regard to transportation. When the century opened the canal era was in full swing, and it is important to note that the canals shown in the map, Figure 10, are the same canal routes which have been recommended as the most suitable for a great modern development of the canals of England. The Bridgewater Canal, the pioneer, traverses Cheshire south of the Mersey and was the precursor of the Manchester Ship Canal. There was a daily service of passenger boats along this canal from Manchester to Runcorn, which town had been rescued from oblivion by the canal, so that it gradually developed a chemical industry. Brindley, its famous engineer, had also helped in the construction of the Chesterfield Canal, which was to supersede the old river route via Bawtry. The needs of Cromford had led to the construction of the canal to join the Erewash Canal, which connected the collieries of eastern Derbyshire with a market in Leicestershire. The disabilities of the Potteries and the salt towns had led to the construction of the Grand Junction waterway with the aid of the Weaver Navigation to join Stoke with the Mersey estuary and also with the collieries of southern Staffordshire. China clay from Cornwall was brought to the Mersey and sent by canal to Stoke, coal was brought northwards. These canals embodied the principle of the maintenance of a water level, and the Erewash Canal winds inconveniently along by the side of the river along the 100-foot contour, except where it crosses the mouth of tributary streams over an embankment; the Peak Forest Canal was noted for its aqueduct at Marple Dale, 93 feet in height and 309 feet long, reputed to be one of the largest in England. The utility of the canals may be estimated from the following charges for the conveyance of a ton of goods from Liverpool to Manchester: by road, 40 shillings; by the canalized river Mersey, 12 shillings; by the Bridgewater Canal, 6 shillings. By the canal a 50-ton boat performed three trips a fortnight, while by the river three trips occupied a month. From Liverpool to Etruria the charge per ton by road was 50 shillings, by canal but 13 shillings 4 pence; freights from Manchester to Derby and Nottingham were halved.

Closely connected with the canals progress occurred in shipping in the Mersey and affected Birkenhead, which was a thinly peopled agricultural district in 1801. Between 1801 and 1820 sailing ships were still in use, and it is recorded that on one occasion a vessel which got out of the estuary before the wind changed sailed to Barbados and back before the other vessels for the West Indies were able to leave harbor. Even so late as 1834 the great spring fleet of 133 ships was held up in the estuary for six weeks by contrary winds, in company with other ships, so that when the wind was favorable 400 vessels departed in one day. The rise of Birkenhead is associated with two factors, first the establishment of steam ferries

to Liverpool in 1828 and secondly the establishment of Laird's shipbuilding yards in 1824 and the docks in 1843. Laird's built the first iron vessel in England in 1829, and, later, the famous *Alabama*. The introduction in 1837 of steamships from the Mersey to the United States reduced the time of the voyage from 28 to 10 days. In 1845 screw steam vessels came into use.

During the early years the roads were of great use, especially for through traffic, and it is noticeable that the majority of the main roads connect cities to the north with London or other cities to the south. For example, the Great North Road passes through the district from Newark to Retford, and its importance was so great that the mails for Nottingham were sent westwards from Newark. The great western road—Watling Street—

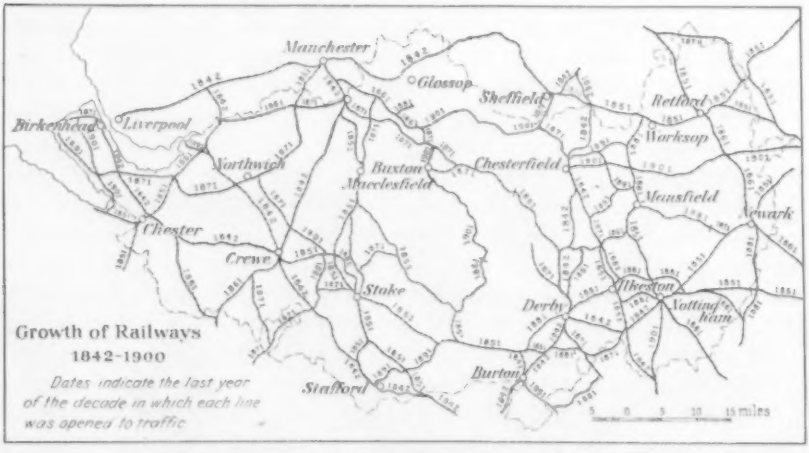


FIG. 11—The growth of railways during the nineteenth century.

passed through Staffordshire and Cheshire and maintained the prosperity of Nantwich and Cheshire during these early years.

The railways date from the first English railway, that between Manchester and Liverpool, opened in 1830. During the decade which followed this date the Midland Counties and the North Midland line were inaugurated, largely for the purpose of providing transport for the coal of eastern Derbyshire. These lines, which were later the basis of the Midland Railway, one of the chief English lines, were planned in a small inn situated in the heart of the colliery district, and in consequence the headquarters of the Midland Railway have remained at Derby. By 1841 the "West Coast" route from Scotland, which traverses the area and centers on the great railway junction at Crewe, was complete from London to Preston, and the "East Coast" route took its original track through the coal fields of eastern Derbyshire from York to the metropolis. The map, Figure 11, shows that by 1851, in addition to these two great cross-routes, connecting links had been established which gave a route from Birkenhead through Stoke, Derby,

and Nottingham to Newark, and from Chester through Manchester, Glossop, and Sheffield to Retford. By this time the lowlands were comparatively well served with railways.

The Second Half-Century

During the period 1851-1901 life in England, perhaps more than anywhere else in the world, underwent a great change of outlook; parochial affairs ceased to have much importance; the Englishman, willy-nilly, acquired some interest in the wide world, for his very existence depended upon circumstances which arose beyond the seas and which affected his existence more and more completely, as railways and steamships, telegraphs and cables achieved success and made the commercial world relatively smaller and more compact. A multitude of influences were at work, and it will not be possible to do more than indicate some of the major forces which affected the people of the Southern Pennines.

The Farmer and His Environment. By the courtesy of the Board of Education it has been possible to obtain from their records the facts which are tabulated below. Groups of contiguous parishes were selected upon the basis of rock-structure and the facts referring to the farm-work of these parishes are indicated in the tables, while the facts regarding the population are shown in Figure 12. Considering the diagram first, it becomes obvious that the farming population has steadily declined since 1851, while it steadily rose during the earlier fifty years: the slope of the curves in Figure 12 indicates that the rate of regression was on the whole slower than the rate of progress; this general feature is exemplified for all the farming districts by the areas labeled D and E in Figures 7 and 8.

Turning now to the tables, we see that the greater portions of the selected districts were under cultivation; the influence of the rainfall is clearly shown, however, since the wetter west contains about 50 per cent more grass than the drier east. Rainfall has a greater effect in this connection than either elevation or rock-structure. Two-thirds of the arable lands was usually under cereals, wheat, oats, and barley, and this proportion remained fairly constant despite (1) a decreased arable acreage, (2) changes in the proportion of wheat in comparison with oats. Barley was only grown in the east, and, whenever it was grown extensively, it maintained its proportion to the total arable area. Wheat gradually declined in importance; about 1870, rainfall and rock-structure had little influence in determining the area under wheat, but with the decline it became obvious that wheat cultivation on the Bunter sandstone was less satisfactory than upon the Keuper, so that the farmer responded to the effects of world competition by cutting down his wheat acreage and by maintaining wheat only where most successfully cultivated,—on the stiffer soils of the Keuper. The effect of the heavier rainfall on the west, the cooler temperatures of the hills and of the displacement of wheat is shown by the

general increase in the importance of oats, which are affected by two other local facts: (1) the need of fodder for the increased number of horses in the factory areas and (2) the use of oat straw for packing pottery wares. The trade in milk to the factory towns, the manufacture of cheese, and the preponderance of grass are all connected with the proportionately large numbers of cattle in Cheshire in comparison with Nottinghamshire; the Keuper marl usually carries more cattle than the Bunter sandstone. The mountain limestone carries sheep well, but the sheep area of greatest value is the Bunter sandstone of the drier east; and where there are many sheep there are many fields of turnips. The noticeable changes which occurred from 1870 to 1901 indicate the effects which world progress—a dynamic factor—produced upon the life of the farmer. The distinguished agriculturist, Mr. A. D. Hall, in "A Pilgrimage of British Farming," comments upon the intensive farming of small holdings from 30 to 200 acres in Cheshire; "the main-stay of Cheshire farming is milk production." The Cheshire farmer usually has two years of oats, one of potatoes and other roots, and one of seeds every four years. In Derbyshire, on the mountain limestone, in the stone-wall country, he found the farms small, about 50 acres, and dependent on milk which is sold to cheese makers, as southern Derbyshire is the home of the Stilton cheese.

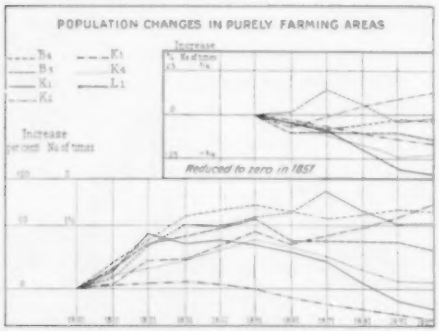


FIG. 12—Variations in the population in purely farming areas. (For key to symbols, see footnote to table opposite.)

The result of the changes for the farmer during the nineteenth century may be, therefore, summarized. For approximately seventy years the farmer worked for local needs in accordance with his opportunities; he sold barley to brewers at Burton, oat straw to the potters, milk to nearby growing towns, some cheese to factors for the London market; he grew wheat and potatoes for the population of the neighborhood. Since 1870 he has grown less wheat, since England has steadily bought more and more wheat abroad, and he has steadily settled down in the west to produce milk and cheese for the factory workers. In the drier east he has retained his interest in sheep on the sandstone country and in cattle and wheat on the marls and clays. Throughout the area he has declined in numbers, and the farther he was removed from the towns the more rapidly have his numbers declined. Over and over again it is recorded that the rural population had migrated to the factories; the frequency of small farms indicates the dearth of agricultural laborers; usually the farm is worked by one or two men.

TABLE SHOWING THE RELATION BETWEEN AGRICULTURE AND ROCK-STRUCTURE

GROUP*	I. AREA OF CULTIVATED LAND: PER CENT OF TOTAL AREA				II. AREA OF GRASS (PERMANENT AND ROTATION): PER CENT OF I				III. AREA UNDER WHEAT[a]			
	1870	1881	1891	1901	1870	1881	1891	1901	1870	1881	1891	1901
B^1	77	86	84	80	36	43	50	46	18	13	5	7
B^2	73	89	87	87	57	66	66	63	27	23	21	20
B^3	78	81	81	81	78	85	90	91	32	23	12	8
B^4	88	99	97	98	34	36	43	43	36	28	22	12
K^1	86	94	91	92	78	82	86	89	35	31	26	28
K^2	89	86	91	94	53	57	59	60	26	29	28	23
K^3	63	60	82	81	71	70	75	73	24	17	10	9
K^4	62	69	71	71	46	50	54	57	34	28	31	24
S^1	89	87	90	88	82	88	90	92	19	21	20	8
S^2	85	85	82	80	62	68	72	75	38	34	30	25
S^3	91	93	88	92	70	73	80	81	32	32	32	32
L^1	84	90	87	90	88	92	94	93	1	2	..	..
L^2	30	41	40	39	94	96	98	98	14	8	..	3
L^3	79	78	79	78	44	51	55	58	26	21	24	18

GROUP*	IV. AREA UNDER BARLEY[a]				V. AREA UNDER OATS[a]				VI. AREA UNDER TURNIPS[a]			
	1870	1881	1891	1901	1870	1881	1891	1901	1870	1881	1891	1901
B^1	23	21	21	23	17	25	34	35	32	32	30	29
B^2	6	3	6	5	30	35	36	36	12	13	14	11
B^3	7	4	1	2	33	45	57	68	8	11	13	13
B^4	23	22	24	23	4	9	17	22	24	27	26	27
K^1	5	11	3	5	25	26	31	31	6	8	14	14
K^2	22	27	25	26	4	6	6	14	13	15	20	19
K^3	1	..	1	1	42	44	52	56	9	7	7	8
K^4	18	22	17	22	4	9	10	10	10	10	10	12
S^1	9	4	3	1	35	42	37	46	12	13	13	7
S^2	9	8	6	7	22	27	34	39	12	15	17	17
S^3	17	13	10	6	17	23	31	28	9	12	15	14
L^1	..	..	..	..	65	69	54	67	17	13	23	16
L^2	2	..	2	4	52	53	54	48	11	8	14	12
L^3	25	26	25	25	12	15	17	23	21	22	20	20

GROUP*	VII. TOTAL OF III, IV, AND V CEREALS				VIII. NUMBERS OF CATTLE PER 1,000 ACRES OF GRASS OF BOTH KINDS				IX. NUMBERS OF SHEEP			
	1870	1881	1891	1901	1870	1881	1901	1901	1870	1881	1891	1901
B^1	58	59	60	65	176	167	157	145	2,390	2,500	2,090	1,380
B^2	63	61	63	61	368	268	255	248	730	555	1,015	350
B^3	62	72	70	78	406	378	521	521	440	76	263	130
B^4	63	59	63	57	276	286	293	249	1,740	1,680	1,830	1,740
K^1	65	68	60	64	410	410	450	420	510	100	420	270
K^2	52	62	59	63	407	450	431	415	875	425	595	440
K^3	67	61	65	66	650	458	320	335	357	113	180	300
K^4	56	59	58	56	456	405	425	390	1,080	416	394	440
S^1	63	67	60	55	350	329	397	365	502	250	414	315
S^2	69	69	70	71	280	254	292	260	591	315	362	311
S^3	66	68	73	66	365	295	320	270	528	110	425	243
L^1	66	71	54	67	280	255	280	282	1,020	895	715	450
L^2	68	61	56	55	350	301	301	286	805	720	800	785
L^3	63	62	66	66	322	291	326	284	1,130	670	630	430

* *Key to Groups of Parishes.*

B^1=Bunter highlands in Nottinghamshire.
B^2= " lowlands in Wirral Peninsula.
B^3= " " " southwestern Cheshire.
B^4= " " " Nottinghamshire.
K^1=Keuper marl near Derby.
K^2= " " " Nottingham.
K^3= " " " Knutsford (area before 1881 different from that after 1881.)
K^4=Keuper marl near Retford.
S^1=Coal Measures near Cheadle.
S^2= " " " Chesterfield.
S^3= " " " Ilkeston.
L^1=Mountain limestone, highland, near Bakewell.
L^2=Carboniferous rocks, highland, near the Peak.
L^3=Permian limestone in Nottinghamshire.

[a] Per cent of arable area less area of rotation grass.

The Miners: Failure and Success. Mention has already been made of the lead mining which occurs in the mountain limestone, especially in the neighborhood of the middle Derwent. This industry is a comparative failure. Figure 13 indicates how the failure of lead mine after lead mine contributed to the decline in population which is characteristic of northern Derbyshire. This failure is due to two forces; the first, dynamic, is connected with the more efficient lead mines which have been operated in other parts of the world, and the second, static, is connected with the difficulties of working the mines, owing to the water which percolates through the limestone. In 1873 Britain produced 74,000 tons of lead ore; this output had dwindled to 28,000 tons in 1901. In that year Derbyshire produced 3,000 tons, about a fourth of the total output of England. In 1882, the four chief lead mines were at Great Hucklow, Haddon, Crich, and Wirksworth, and in these about half the total output of the county was obtained. No other mine yielded as much as seventy tons per annum, and thirty smaller mines are specified in the mining records as yielding less than ten tons each annually. By 1901 the decline had been so general that only twelve mines could be specified from each of which the annual yield amounted to at least five tons.

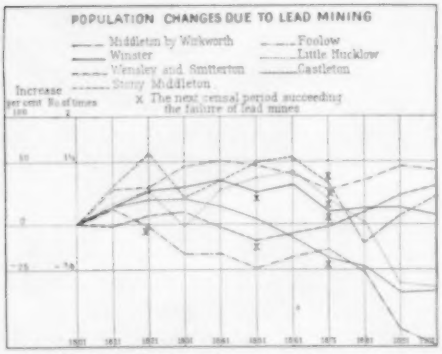


FIG. 13—Population changes due to lead mining.

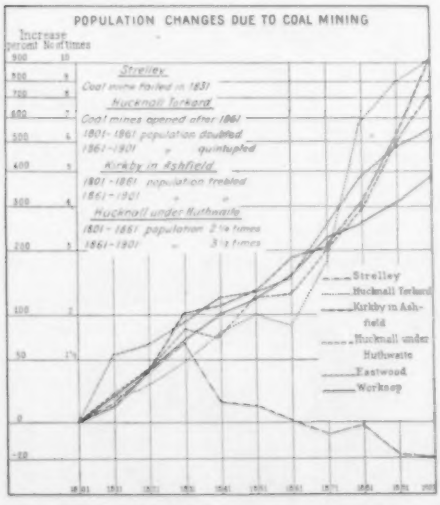


FIG. 14—Population changes due to coal mining.

Salt mining is localized in the Weaver Valley, where the progress in population has been, on the whole, normal. This district yielded 56,000 tons of rock salt in 1901, which was just over half the total production of England. The British production of salt has been approximately steady since 1881 at 2,000,000 tons annually.

In tune with the prevalent tendency towards industrial concentration the salt mines have ceased in outlying places such as Nantwich, and the chief centers since 1882 have been Northwich and Malpas. Salt mining has affected the population chiefly by the growth of the dependent industry of chemical manufacture and has caused the growth of Northwich and Runcorn, as well as neighboring towns north of the Mersey, as definitely urban factory towns.

The chief mines are the collieries. The coal mines were important before 1851, but their relative importance has steadily increased since that date, so that the colliery areas are usually indicated by so great a growth of the population that it increased from sixfold to tenfold during the century (Fig. 14). In Nottinghamshire the pits have gradually extended eastwards, but near Macclesfield they have declined. The following table indicates the number of pits in operation at the dates named, and it may be remarked that a pit in 1901 was a vastly more productive place than in 1811.

NUMBER OF COLLIERIES IN OPERATION

CHIEF TOWN IN DISTRICT	APPROXIMATE AREA OF DISTRICT IN SQUARE MILES	NUMBER OF PITS IN:—						
		1811	1854	1861	1871	1881	1891	1901
Stockport	60	29	19	26	27	35	19	24
Macclesfield	30	40	14	19	10	6	3	4
Stoke	80	25	123	128	111	144	146	122
Burton	30	14	7	11	10	16	23	18
Ilkeston	40	17	7	12	14	23	20	23
Ripley	40	19	11	14	13	17	20	19
Alfreton	80	28	21	23	22	31	19	28
Chesterfield	100	69	71	60	45	109	98	89
Nottingham	*	20	17	20	29	40	52	61

* Continually increasing, as pits were sunk through the Permian limestone and the Bunter sandstone to the east of the Coal Measures.

The table clearly indicates great progress everywhere except in the Macclesfield district; and this fact is emphasized by the next table, which shows that the output in Cheshire is small and declining while that of Nottinghamshire especially shows a remarkable increase.

COAL PRODUCTION AND PEOPLE EMPLOYED

COUNTY	COAL PRODUCED IN MILLION TONS				NUMBER OF MINES		PEOPLE EMPLOYED IN THOUSANDS		
							TOTAL	1901	
	1854	1882	1891	1901	1854	1901	1854	ABOVE GROUND	BELOW GROUND
Nottinghamshire	0.8	5.0	7.2	8.2	17	61	3.7	5.6	22.2
Derbyshire	2.4	8.4	11.0	14.9	117	177	5.4	10.0	39.9
Cheshire	0.8	0.8	0.7	0.6	33	28	2.6	0.6	2.2
North Staffordshire	...	4.9	5.1	(a)	123	122	(a)	(a)	(a)

(a) All Staffordshire in 1901, 13.1 million tons, 351 mines, 11.9 and 37.2 thousands of people above and below ground respectively; 25.7 thousands all told in 1854.

The change in value of each pit is important; for example, in 1854, there were in Nottinghamshire 17 pits with, on the average, 220 persons

employed at each, while in 1901 there were 61 pits with 450 employees each.

The coal miners form one of the chief elements in the populations of the districts labeled A^1 and A^2 in Figure 7; in fact, the distinction between the areas A^1 and A^2 is almost entirely due, in the County of Nottingham, to the fact that the pits were only opened in the Leen Valley (A^2) during the second half-century (Hucknall Torkard, Fig. 14).

These three minerals, lead, salt, and coal, are typical of three forms of population change (coal—great progress, above the normal; salt—normal development; lead—regression), and they exemplify how dynamic factors such as railway development, growth of nearby markets, the invention and use of steam engines, the need for new products such as bleaching powder override the purely passive factors such as rock-structure in utterly changing the lives of men. The Leen Valley shows this overpowering influence with great prominence. The traveler journeys southwards through Sherwood Forest. He is surrounded by sylvan glories, a wealth of gorse, dainty silver birches in clumps, and groups of majestic beeches. Suddenly he halts at the head of a valley. In the foreground the valley sides are cultivated and there is peaceful farm-land; the background is obscured by the rolling clouds of smoke from the pit heads in the middle distance. He reaches the collieries by a devious route, for there is no road which leads direct from the forest to the mine. He is in a narrow valley in which flows a tiny stream; the lowland is completely filled by railway tracks; three different railway companies have built their roads now side by side, now interlaced, again one crossing the others obliquely, and beside the tracks are the pit heads with their tall chimneys and winding wheels in alternation. Each pit steadily encroaches on the farm-land, which yields reluctantly; the rubbish from the mine lies in long hillocks which smoke from the combustion within, and crops grow within a yard or two of these unsightly mounds. The last years of the century saw a smiling farming valley become the busy home of thousand of miners.

Workers in the Coal-Fields. The beginnings of the manufacture of iron goods have previously been noted. The following table indicates the progress which was made during the second half-century in the areas indicated in Figure 10. The iron furnaces fluctuate in number considerably, but there is a steady increase in the average output per furnace during the period reviewed.

PIG-IRON PRODUCTION

DISTRICT	NUMBER OF BLAST FURNACES				TOTAL PRODUCTION IN 1,000 TONS			
	1861	1871	1882	1901	1861	1871	1882	1901
East Derbyshire	24	38	40	30	130	270	373	450
North Staffordshire	24	31	25	14	188	268	276	200

It is impossible to distinguish the effect of the iron works from that of the collieries in so far as they jointly affected the population in their neighborhood. A typical area for the dual industry centers on Ilkeston; the outlook is dreary in the extreme. To stand in Nottinghamshire, above the left bank of the Erewash, and see below you first the canal swung across the mouth of a side valley by a dirty brick viaduct, beyond the canal the dull and dirty river, the land between you and the stream a desolate waste, above which rises a dull dingy building on which the brightest spot is the escaping steam, and the far side of the valley thick with small brick and slate houses above the roofs of which project the larger gaunter buildings of iron works and factories, and over all a pall of smoke—is to view a dismal scene where there is no green of vegetation and the few trees stand gaunt and skeleton-like memorials to man's conquest of his environment. Mid-summer rain is falling, yet no amount of water could apparently make the district fresh and clean.

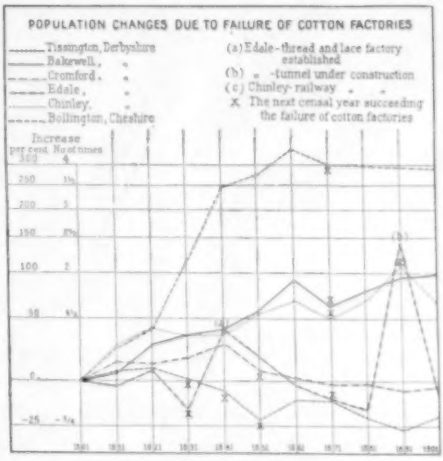


FIG. 15—Population changes due to failure of cotton factories.

During the early years of water power and experimental steam power cotton factories lay somewhat scattered along a line from Manchester past Stockport to Derby and Nottingham. Yet even the factories tended to concentrate; Figure 15 indicates the results of this tendency. Normally the cotton factories caused the population to increase at least fivefold, but in the cases shown in Figure 15 progress was changed to decline when the absence of coal and the difficulties of climate or transport caused the factories to fail. The cotton workers, therefore, are largely concentrated between Stockport and Glossop in the north and between Derby and Nottingham in the south, where maximum concentration of workers gradually occurred. The southern area is unsuited by climate for variety of cotton goods and specializes in hosiery and lace and contains 30 per cent and 70 per cent of Britain's makers in these commodities respectively. By inertia some cotton factories still linger in the Derwent Valley, but an owner remarks that he can only spin the coarser counts of cotton thread by surrounding his factory with canals, so great is his climatic disadvantage. The Stockport district strictly belongs to the cotton district of southeastern Lancashire; its relative importance may be gaged from the fact that it contains but 8 per cent of Britain's workers in cotton, while in the immedi-

ate district beyond the Mersey the cotton operatives are almost ten times as numerous. Striking evidence of the effect of cotton on the population is afforded by Figures 16 and 17, which are maps of Longdendale and its neighborhood. Figure 16 is based upon Doctor Aikin's map (about 1795), and Figure 17 is based upon a modern map made a century later. Doctor

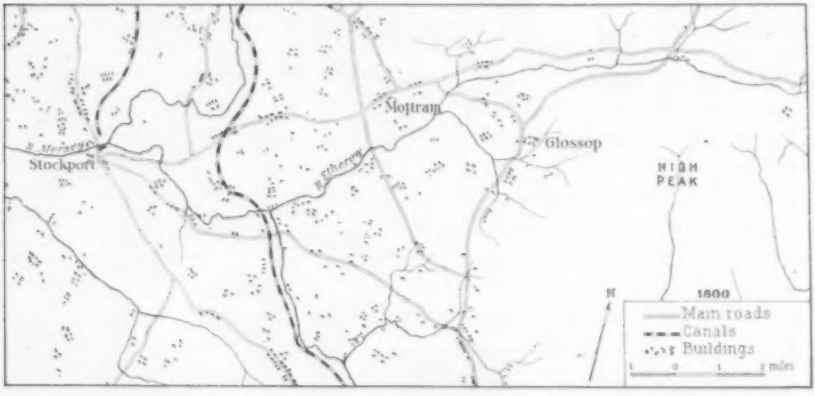


FIG. 16—Stockport and Longdendale about 1800 A.D.

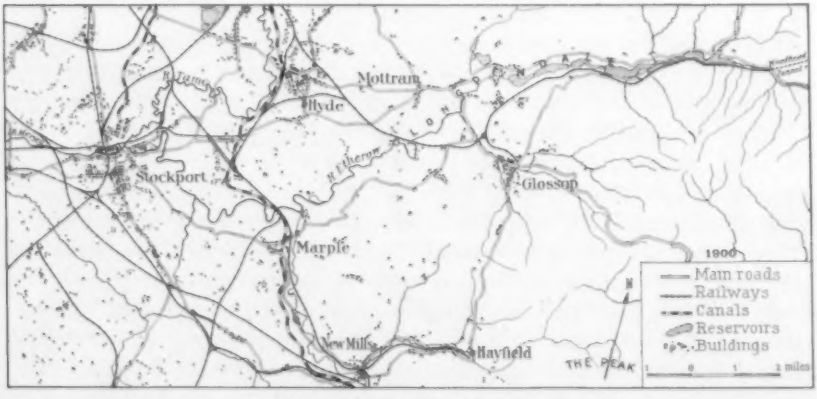


FIG. 17—Stockport and Longdendale about 1900 A.D.

Aikin's map is, on the whole, an excellent piece of cartography; the rivers are well drawn. The main rivers and canals have scarcely altered during the century; the upland still contain few houses. But note the buildings in modern times. Manchester, which is just off the northwest corner, stretches continuously to Stockport and Hyde, and Stockport extends almost in the same way to Marple and New Mills. The new railways form a notable addition to the map. The reservoirs were built to give Manchester an adequate supply of water; they date from about 1850. The

Mersey below Stockport (on the edge of the map) was crossed by ferry until 1850; only since 1877 have adequate bridges been available. The buildings lie along the edge of the coalfield; at Dukinfield, west of Hyde, a pit over 6,000 feet deep was considered in 1880 to be one of the deepest in the world.

The Effect of the Railways. Before 1851 the early railways had formed part of the East and West Coast routes from London to the north; in this respect the iron road had accepted the tradition of the turnpike,—it crossed the area of the Southern Pennines in order to form connections between more important areas both to the north and to the south. During the period of the railway mania in the forties much of the capital subscribed to the numerous schemes came from Manchester and Liverpool, which were desperately anxious to open communications to the south. Consequently the railways may be regarded as a dynamic factor influencing the population from without. Some direct results of railway construction are to be seen in Figure 18. At Shardlow there had been a large posting station, but when the railways served the nearby town of Derby the people of Shardlow migrated. At Wormhill the convenience of the railway brought inhabitants after 1861. In most other cases the effect of the railways cannot be disentangled from the effect of coal and cotton, so that the influence of the iron road can only be traced in Figure 11 by the examination of the new railways as they were gradually constructed. The main features of the railway connection were determined before 1851, so that the rest of the century was spent in adding connecting links and in duplication of routes; at the same time the existing routes increased the number of tracks from single to double and often to quadruple sets of metals.

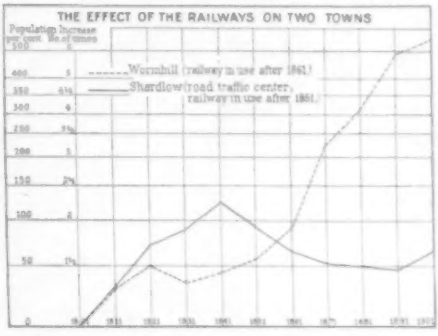

THE EFFECT OF THE RAILWAYS ON TWO TOWNS
Population Increase per cent. No. of trains
Wormhill (railway in use after 1861)
Shardlow (road traffic center, railway in use after 1851)

FIG. 18—The effect of the railways on two towns.

The Great Northern Railway connection through Newark and Retford, opened by 1861, brought the great East Coast route to its present track from London through these towns to York and Newcastle and displaced Derby. Cross-connections between Stoke, for example, and Northwich were made in three stages. The eastern colliery district is noteworthy for its numerous railways, which are thoroughly linked together by routes which have been steadily developed since 1851. This progress was uniformly maintained, since during the period 1851-1901 the number of people per mile of railway was steady at approximately 2,000. In 1851 about 14 per cent of the area was more than five miles from a railway line; but by 1901

no land was so far removed from the iron road. About two-fifths of the area was at least two miles from the railway in 1851, and this area was reduced to about one-fifth in 1901.

Conclusion

It will be well to summarize the main results of this investigation in a tabular form which necessarily takes notice only of prominent elements in the environment of these people who have lived on the edge of the industrial North and consequently have been affected by the triumphs of machinery and steam and yet have preserved elements of individuality; the cotton workers of Nottingham differ from those of Stockport, and the potters have a different character from the brewers of Burton. Only within the last few years of the nineteenth century is it true to say that the workers of a given industrial area have emerged to any degree from the isolation in which the early days of the industry were necessarily passed.

Summary of Environmental Influences and Their Effect on the Population

Occupation of the people	Static factors	Dynamic factors	Effects on the population
Coal mining.	Coal Measures.	(1) Establishment of factories, iron works, potteries near the coal to satisfy an external demand. (2) Roads, railways, canals, to connect the mining areas with the great trunk routes of England.	(1) Report steady increase at the maximum rate near the old collieries. (2) Sudden enormous increase when new pits were sunk. (3) Migration to coalfields from rest of area.
Cotton working.	(1) Rainfall and humidity. (2) Coal Measures.	(1) External supplies of raw cotton. (2) External demand for cotton goods.	(4) Immigration to coalfields from rest of England.
Pottery working.	(1) Coarse clay. (2) Coal Measures.	(1) External supplies of china clay. (2) Demand for pottery and china.	(5) Scarcity of labor on farms; therefore farms are small.
Salt mining.	Keuper marl.	Roads, canals, railways.	Steady normal increase.
Lead mining.	Mountain limestone.	World changes in sources of supplies of lead.	Decline.
Sheep rearing.	Mountain limestone. Bunter sandstone.	Absence of railway.	Sparse population with slight change.
Mixed farming for milk, oats and potatoes.	Rainfall (the wetter west).	(1) Demand for food supplies from factory towns.	(1) Comparatively dense rural population in west.
Mixed farming for milk, barley, wheat and turnips.	Rainfall (the drier east).	(2) World changes in farming cause (a) decline in wheat acreage; (b) increase in pasture land.	(2) Steady or declining population in general. (3) Migrations from the farms.

THE POSITION OF THE NEW ENGLAND PENEPLANE IN THE WHITE MOUNTAIN REGION*

By A. K. LOBECK

[With separate diagram, Pl. II, facing page 56.]

The extensive upland which covers much of New England is interrupted in its northern portions and especially in those most distant from the sea by several mountain groups. Chief among these are the White Mountains, which culminate in the splendid series of peaks and crests known as the Presidential Range, whose highest member, Mount Washington, lifts its summit a mile above the valleys at its base. From marginal peaks, as for instance Mount Kearsarge, near North Conway, a magnificent outlook to the east and south over the broad upland may be obtained, and so open is the view that it is even possible to see sailing vessels along the coast sixty miles away. Whether the White Mountains represent the northern part of the New England upland, strongly uplifted and dissected, or whether they are a group of monadnocks standing upon the remarkably well-developed peneplane recognized in the upland surface, is the thesis of this article.

The New England peneplane is one of the best-known topographic features of Massachusetts, Rhode Island, and Connecticut, and is characteristically developed in southern New Hampshire. The area as a whole has been made classic by the work of Professor Davis, and the reader is referred to his "Physical Geography of Southern New England" for a vivid picture of the character of the country.[1] Among the monadnocks in this part of New England he mentions Mount Monadnock in New Hampshire, Mount Wachusett and Blue Hill in Massachusetts. Professor Davis emphasizes the fact that "there are not many monadnocks in southern New England: the rolling upland is seldom dominated by any strong summits . . . . . but on passing northward into Vermont, New Hampshire, and Maine, monadnocks are common. The White Mountains seem to be only a cluster of unconsumed remnants . . . . . but, in spite of the nearness of these northern states, they have not been explored with the upland peneplain and the monadnocks in mind. No definite statement can at present be given as to the altitude of the upland in northern New England, or as to the degree of perfection that it attained. The region invites careful investigation." The same view was later expressed by Professor Davis as follows: "The White Mountains have been, in my mind, tentatively classed as a group of monadnocks; they do not, as

* My thanks are due to Professor D. W. Johnson of Columbia University, whose course in the Physiography of the Eastern United States first created an interest in this problem.

[1] National Geographic Monographs, American Book Co., New York, 1896, pp. 269-304; references on pp. 282-283.

far as I have seen them in brief excursions, stand upon any distinct basement comparable to that of the uplands of New England further south . . . . . Its [northern New England] ruggedness is generally so great that it is quite possible that the peneplain explanation does not apply to the greater part of the area. Little wonder that an observer whose attention is given to this mountainous district, under the impression that its mountain tops represent the remnants of a peneplain, should come to discredit such an explanation."[2]

The monadnock character of the White Mountains has also been pointed out by Doctor Bowman, who says[3] in addition that the "plateau remnants that lie about their bases are from 1,000 to 2,000 feet elevation above the sea." He remarks[4] that "The whole of Maine southeastward of the White Mountains axis is a gently inclined upland sloping with marked regularity toward the sea," and gives a section of local area which shows the remarkable degree of base-leveling that had been reached. While portraying one general character of the peneplane the section is, however, too far from the mountains and too close to the sea to serve as evidence of that relationship between the mountains and the upland which forms the theme of this paper.

On the other hand, Professor Goldthwait, in one of his interesting articles on the White Mountains published two years ago, made the rather striking suggestion that the flat-topped spurs near the summits of the range at an altitude of about 5,000 feet may represent remnants of an old graded upland and that quite possibly this upland is the northern extension of the New England peneplane.[5] Not only does he suggest "that the subdued cones of Washington, Jefferson, Adams, and the other summits of the range are low monadnocks surmounting a peneplain whose only surviving fragments, in this district, are the upland lawns and Alpine pastures that lie along the crest of the range," but he points out the possibility that this peneplane is the New England upland so well known to the south.

A study of the region has led the writer to conclude that the New England upland is not to be recognized in the higher levels of the Presidential Range but that it abuts abruptly against the foot of the mountains. The flat-topped spurs described by Goldthwait are far above the upland level and cannot be correlated with it. The evidence leading to this conclusion was derived from a study of maps and from work in the field.

Map Evidence: Projected Profiles. The evidence available from the maps was secured by preparing a series of profiles in such a manner that the New England peneplane might be traced from the places where it is

[2] W. M. Davis: The Peneplain, *Amer. Geologist*, Vol. 23, 1899, pp. 207-239; references on pp. 209-210.
[3] Isaiah Bowman: Forest Physiography, New York, 1911, p. 645.
[4] *Ibid.*, p. 646.
[5] J. W. Goldthwait: Remnants of an Old Graded Upland on the Presidential Range of the White Mountains, *Amer. Journ. of Sci.*, Vol. 37, 1914, pp. 451-463; reference on p. 453.

well known and easily recognizable to the White Mountain region, where its position is in doubt. The maps suitable for this purpose are (1) the contour maps in Hitchcock's atlas of New Hampshire[6] and (2) the topo-

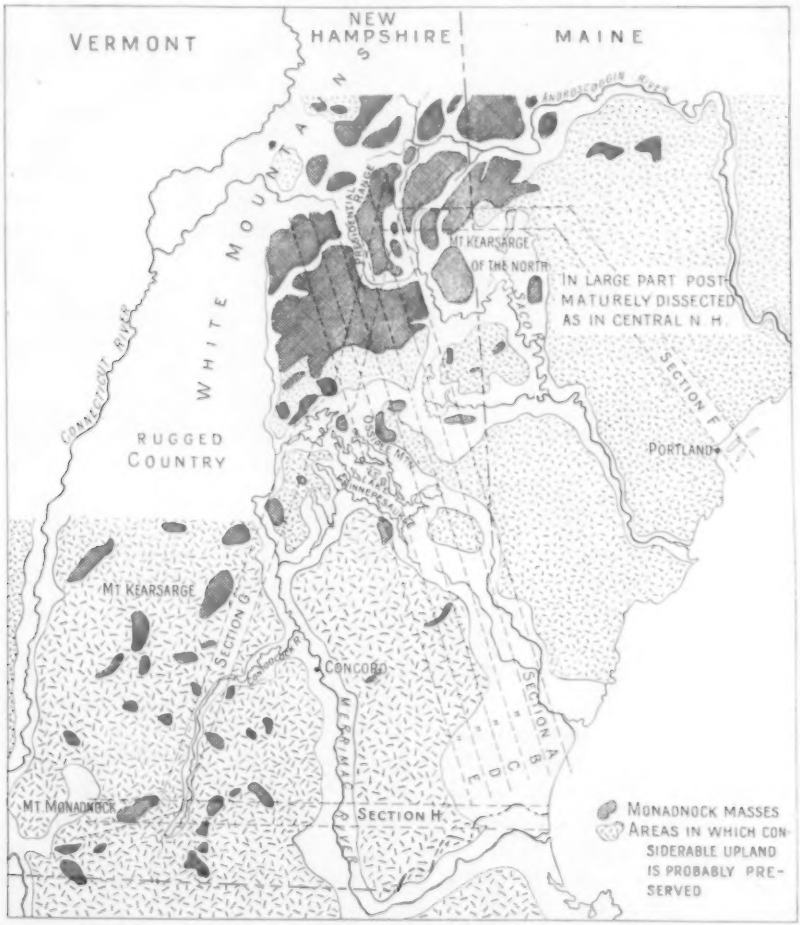


FIG. 1—Diagrammatic sketch map of New Hampshire and western Maine showing monadnock masses and approximate distribution of the New England peneplane. Scale, 1:1,800,000. The position of the profiles of Figures 2 to 5 is indicated.

graphic sheets of the U. S. Geological Survey covering the White Mountains and the contiguous territory of western Maine.

The topography of belts of country three miles wide was so projected that any given point on the profile always represents the highest point in

[6] C. H. Hitchcock: Atlas Accompanying the Report on the Geology of New Hampshire, Julius Bien, New York, 1878.

the belt opposite such point in the profile. Such a profile is exactly that which would be obtained by isolating this belt of country and then looking at it from the side so that only the highest points form the line of profile. The result is an impression strikingly similar to that which one would get by looking at the country itself.

In choosing the width of belt to be projected for the purpose of revealing the existence of a badly dissected and monadnock-crowned upland, it is desirable to make the belt sufficiently narrow so that it will not encounter too many monadnocks and yet wide enough to span most of the valleys which happen to run parallel with it. If too narrow it approaches an ordinary profile and is unduly irregular because of the numerous valleys. If too wide it is also irregular, but this time because it covers so much country as to give a sky-line made up almost entirely of monadnock profiles.

The difference between this method of constructing profiles and that used by Professor Barrell[7] in his work on the supposed marine benches of Connecticut and Massachusetts is a minor one and depends mainly upon the information desired. In the method here used the tops of only those hills which form the sky line are projected. In that used by Professor Barrell the outlines of all hills in the foreground are also projected in order to reveal remnants of planes at lower levels.

A strip of country fifteen miles wide extending from the summits of the White Mountains to the sea was selected and subdivided into five parallel belts, each three miles wide. For each belt a projected profile was drawn on the basis of the contours shown in Hitchcock's atlas of New Hampshire. The position of this strip of country is shown in the sketch map, Figure 1, with the several belts marked A, B, C, D, E; and the series of projected profiles superimposed upon each other is shown in Figure 2. Each one of the profiles indicates that the New England upland in central New Hampshire ends abruptly at the base of the mountains at an altitude of 1,000 to 1,100 feet above sea level. The immediate coastal portion has been largely dissected or removed by the Exeter River and the tributaries of the Piscataqua and Merrimac Rivers. The position of Boott Spur, one of the flat-topped "remnants" at an altitude of 5,000 feet near the crest of the range, is also shown. It seems difficult to believe that this spur can in any way represent a part of the New England peneplane, which is so distinctly preserved at a much lower level. Several of the profiles pass through prominent monadnocks, as for example Ossipee Mountain, and some traverse pronounced lowlands, notably that now occupied by Lake Winnepesaukee.

A projected profile drawn from Mount Washington through southwestern Maine shows quite the same relation between the mountains and

[7] Joseph Barrell: Piedmont Terraces of the Northern Appalachians and Their Mode of Origin (abstract), *Bull. Geol. Soc. of Amer.*, Vol. 24, 1913, pp. 688-670; reference on p. 689.

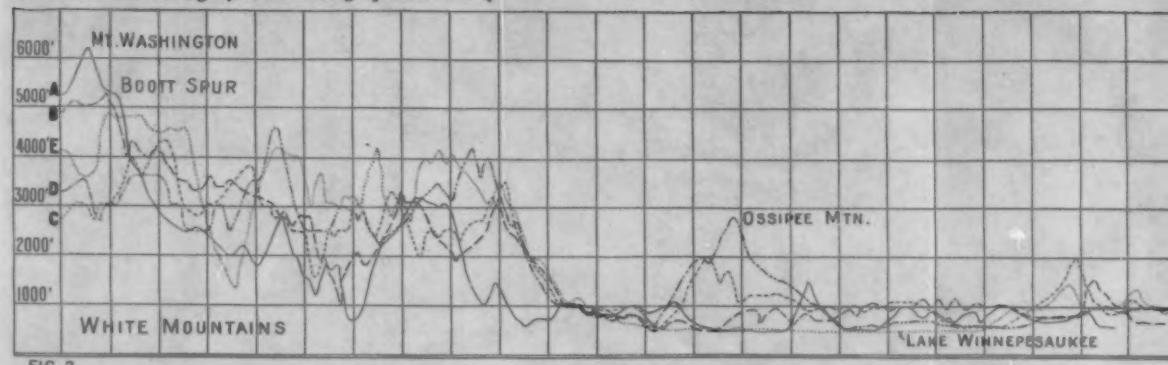


FIG. 2

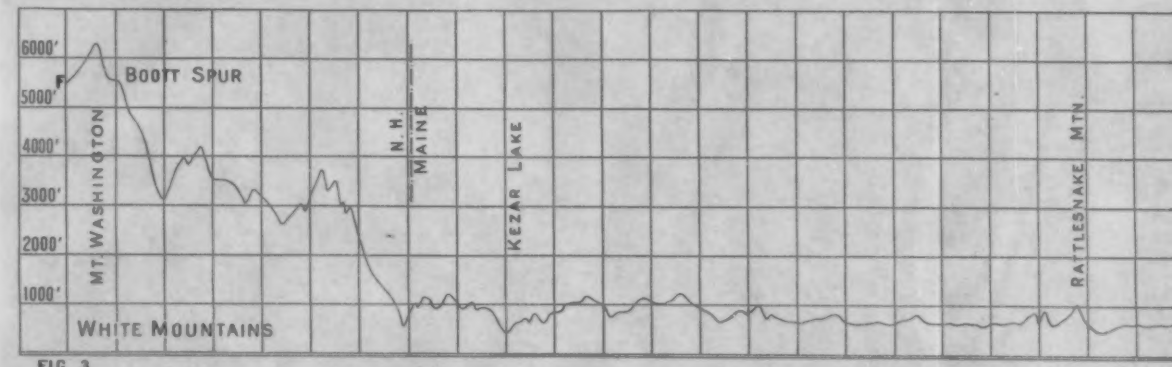


FIG 3

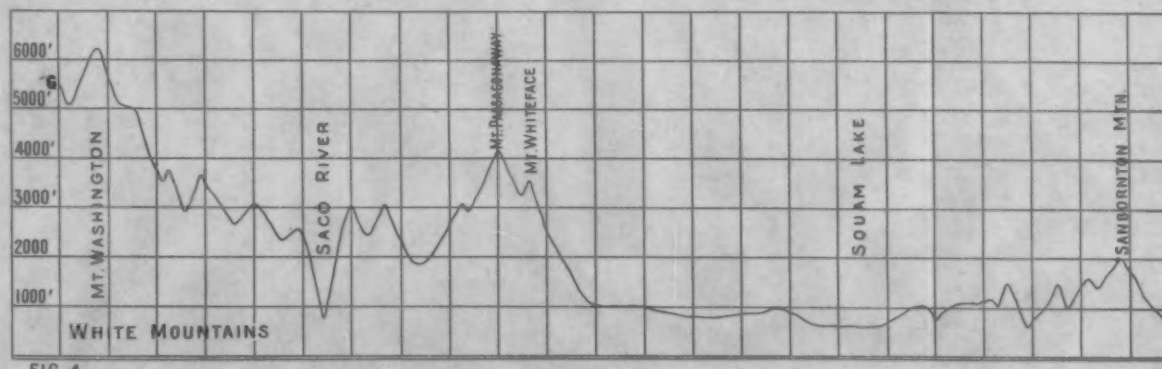


FIG. 4

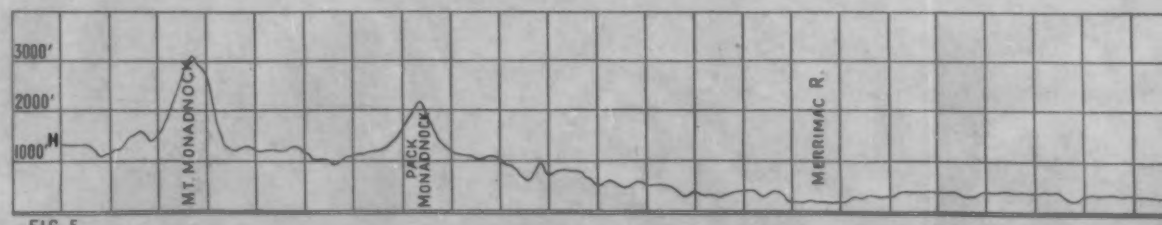


FIG. 5

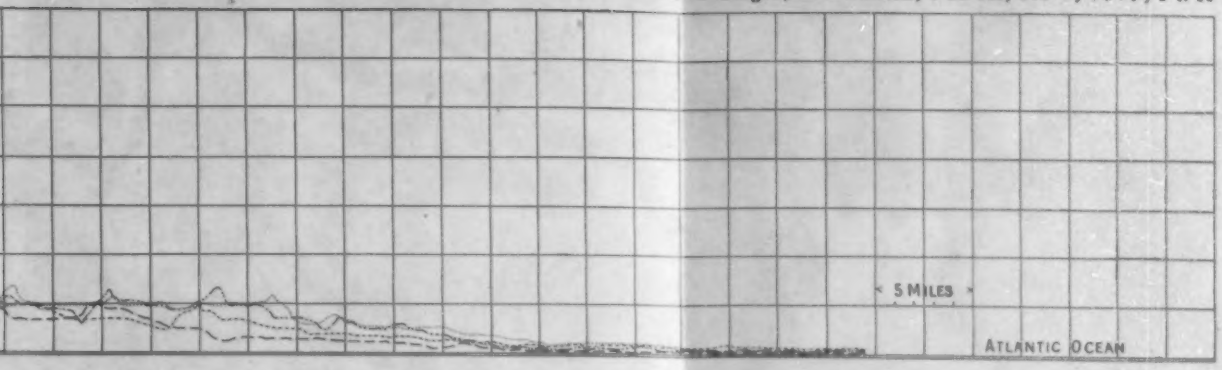
FIGS. 2-5. Profiles of the New England

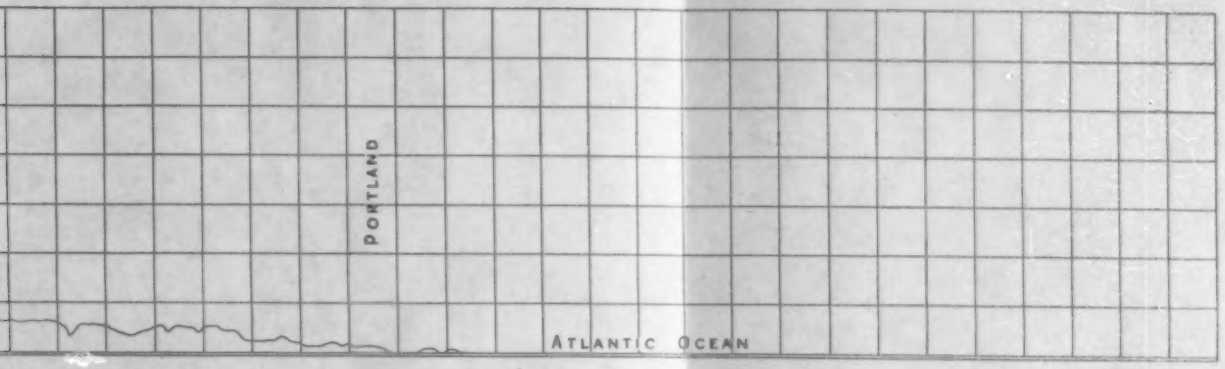
FIG. 2—A series of five projected profiles from the Whi

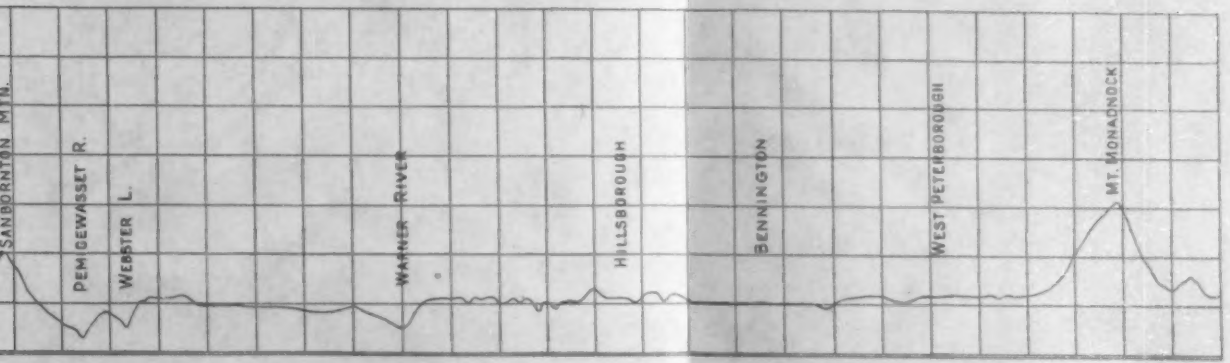
FIG. 3—Projected profile from the White Mountains to

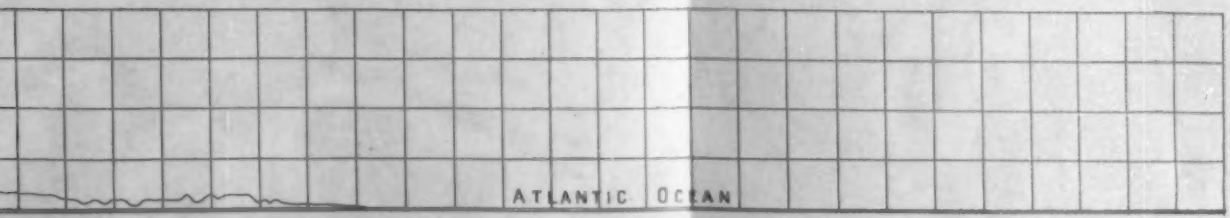
FIG. 4—Projected profile passing through Mount Mona

FIG. 5—Projected profile passing through Mount Monad









ngland peneplane in the White Mountain region.

he White Mountains through central New Hampshire to the coast.

ins to the sea, passing through western Maine.

Monadnock and the White Mountains.

Monadnock to the coast.

FIG. 6.

FIG. 7.

FIG. 6—The New England peneplane at the base of the White Mountains north of Ossipee Mountain.

FIG. 7—Similar to Figure 6 in showing the helflike remnant of the New England peneplane flanking the White Mountains north of Lake Winnepesaukee.

the peneplane (Section F, Fig. 3). A similar projected profile covering a belt passing through Mount Monadnock and Mount Washington is shown in Section G, Figure 4. This section shows very distinctly the peneplane as characteristically developed around Mount Monadnock and proves its continuation northward until abruptly terminated at the White Mountains. Section H, Figure 5, a projected profile drawn east from Mount Monadnock to the sea, illustrates the character of the peneplane in southern New Hampshire.

The evidence from these sections is quite conclusive and seems clearly to place the New England peneplane at the base of the mountains at an elevation of approximately 1,000 feet.

Field Evidence. Field study shows that it is possible to trace the upland from its well-recognized position at the base of Mount Monadnock, where it stands at an elevation of about 1,100 feet, northeast along Contoocook River to near Concord, where its altitude is 800 feet. North of this point it rises again to about 1,000 feet near Lake Winnepesaukee. In central and eastern New Hampshire it is post-maturely dissected and the broad lowlands are occupied by lakes and alluvial plains which lie 400 to 500 feet below the peneplane level. In the Lake Winnepesaukee region it is, as a matter of fact, difficult to trace the upland for the reason that it is preserved only as fragments and the region is complicated by the presence of such residuals as Ossipee Mountain which rise directly from the lower lake-strewn plain. However, at the base of the White Mountains north of Lake Winnepesaukee, the upland is undoubtedly represented by a pronounced bench or shelf and adjacent remnants which stand at an elevation of nearly 1,100 feet. The photographs, Figures 6 and 7, show this remnant flanking the mountains which are visible in the distance. In the foreground is one of the alluvium-filled valleys cut several hundred feet below the peneplane level. These views were taken looking north near the little town of South Tamworth at the north end of Ossipee Mountain.

A critical point in the field for observation is Mount Kearsarge of the North, which stands almost at the southern edge of the mountains near North Conway. From this position toward the northwest the peaks and spurs of the Presidential Range are distinctly visible. To the south Ossipee Mountain stands out with the broken peneplane stretching away to the southeast. Just north of Ossipee Mountain is the lowland which separates it from the White Mountains. Along the base of the mountains and projecting into this lowland may be seen the shelflike remnant before mentioned. In the mountains there is no more suggestion of the peneplane. It is practically impossible from this viewpoint to conceive how the level upland terminating abruptly at the base of the mountains can also be represented by the spurs near the crest of the range at some 4,000 feet greater elevation. To the east there is a similar contrast between the re-

markably well-developed upland of western Maine and the steep slopes of the mountains.

Conclusion. An attempt is made in the sketch map, Figure 1, to indicate the areas in which remnants of the peneplane are now preserved. The map does not pretend to be precise in detail, but the comparative extent of dissected upland, monadnock residuals, and broad lowlands is suggested and may convey to the mind a useful picture.

We can describe the region of central and southern New Hampshire as a post-maturely dissected peneplane surmounted by numerous monad-

FIG. 8—Boott Spur, a remnant of the upland bench or terrace projecting from the side of Mount Washington.

nocks, especially away from the stream courses. The broad valley floors are covered with alluvium or, where blocked by glacial drift, form shallow though sometimes extensive lake basins, as that of Lake Winnepesaukee. The peneplane rises gradually from the coast and ends abruptly at the foot of the White Mountains, where its elevation is about 1,000 feet. In western Maine the peneplane is remarkably well preserved and appears to be less dissected than in New Hampshire. The conclusions derived from both field and map study are in strict accord, and one is constrained to believe that the spurs near the mountain crests have no relation to the upland so well developed to the east and to the south.

The fact that these spurs may have another meaning has not been overlooked by Professor Goldthwait. He gives as suggestions[8] "that the flat-

[8] J. W. Goldthwait, *op. cit.*, p. 462.

ness of the crown of the range is due chiefly to the more rapid reduction of the slopes above the tree line, where frost action and the movement of rock waste are more vigorous than in the forest," or "that one might look for some structural control of the upland flats—some dominant system of joints, or some very extensive development of schistosity in plains near the horizontal." And he mentions the possibility "that the flattening out of these graded slopes, in their descent, near the 4,000-foot contour is not as real as it appears to be; that the original well-graded slopes of the range have been so deeply and so widely scooped away by local glaciers and the resultant spurs have been so much worn, especially at low altitudes, by glaciation during the subsequent regional glaciation that the effect is a false appearance of an uplifted and extensively dissected cluster of low monadnocks."

Observations by Professor D. W. Johnson on the north end of the range lead him to the opinion that the great discordance in the heights of the flat-topped spurs, amounting in cases to more than a thousand feet, and the fact that several of the supposed upland remnants have a high angle of slope, militate against any theory of their origin which would consider them parts of a former peneplane. My own brief study inclines me to believe that the spurs are not so pronounced a feature as to demand any special explanation.

ATLANTIS, THE "LOST" CONTINENT

A Review of Termier's Evidence

In order that its readers might have a well-balanced criticism of Termier's brilliant paper on the question of Atlantis, the "lost" continent of the Atlantic, the Society has requested two independent reviews. The first is by Dr. Rudolph Schuller, formerly of the Museo Goeldi of Pará, Brazil, a well-known specialist in historical geography, and the second is by Professor Charles Schuchert of Yale University, one of the foremost authorities in historical geology and paleontology.

Termier does not believe geology will solve the problem, though he uses arguments with geological implications. On the other hand, portions of the earliest maps recording the names and positions of the islands are based wholly on traditions whose origins it seems impossible to determine. To have both sides of the question discussed by competent critics is at least to put us in possession of Termier's strongest points.

(I) By RUDOLPH SCHULLER

For many centuries the question of Atlantis and other mythological islands said to exist beyond the Pillars of Hercules in the "shadowy," "gloomy" ocean have engaged the interest and enthusiasm of man. The same question has been lately taken up by a noted French scholar, Professor Pierre Termier, Director of the Geological Survey of France, in an article[1] which, from several points of view, is one of the foremost contributions to that complex theme.

Termier first transcribes the passage from the "Timæus," or "Concerning Nature," of Plato, who, as will be remembered, has preserved for us the tale of Atlantis. There are four speakers: Timæus, Socrates, Hermocrates, and Critias. The latter, in referring to Solon, the great law-giver of Athens six hundred years before the Christian era, tells of a journey that this ancestor of Plato made to Saïs, in the delta of Egypt. An old Egyptian priest revealed to him there the history of the beginning of Athens, "all but forgotten by the Athenians."

"That sea (the Atlantic)," we read in the most interesting part of the narrative, "was then navigable and had an island fronting that mouth which

[1] Pierre Termier: Atlantis. *Annual Rept. of the Smithsonian Institution for 1915*, pp. 219-234, Washington, 1916 (translated from *Bull. de l'Inst. Océanogr. No. 256*, Monaco, 1913).

For other recent discussions of the problem see—

Louis Germain: Le problème de l'Atlantide et la Zoologie, *Annales de Géogr.*, Vol. 22, 1913, pp. 209-226.

L. F. Navarro: Estado actual del problema de la Atlantis, *Bol. Real. Soc. Geogr.*, Vol. 58, 1916, pp. 178-212. Madrid.

you (Solon) in your tongue call the Columns of Hercules . . . . And there was a passage hence to the rest of the islands, as well as from these islands to the whole opposite continent that surrounds that sea . . . . . The island of Atlantis itself was plunged beneath the sea and entirely disappeared; whence even now that sea is neither navigable nor to be traced out, being blocked up by the great depth of mud which the subsiding island produced."

As to the authenticity of Solon's trip to Egypt, we also possess the testimony of the historian Plutarch, who uses the words "On the Canopian shore, by the Nile's deep mouth" when dealing with the ten years' absence of the sage from Athens. The same authority, in referring to Plato's description of Atlantis, says: "Plato, ambitious to cultivate and adorn the subject of the Island of Atlantis as a delightful spot in some fair field unoccupied, to which also he had some claim by reason of his being related to Solon, laid out magnificent courts and enclosures and erected a grand entrance to it, such as no other story, fable, or poem ever had. But, as he began it late, he ended his life before the work was completed, so that the more the reader is delighted with the part that is written, the more regret he has to find it unfinished."

There can be no question that Plato's narrative of Atlantis has not at all the coloring of a mere fable. "It is of an exactness almost scientific," Termier correctly observes.

From modern geological, zoölogical, and botanical researches, it seems highly probable that, during the geological period called Eocene and until the Pliocene and Miocene, a land-bridge across the present Atlantic Ocean connected Europe with this continent. A cataclysm followed. Submersions and convulsions entirely changed the aspect of that section of the earth. It is not known whether they were of tectonic or of volcanic origin. Termier seems to assume the latter. The West Indies, the Bermudas, the Canaries, the Azores, and other islands may be the remains of the vast island or continent submerged in the Atlantic Ocean. Was such a catastrophe possible? The cataclysm is undoubted, asserts the French scholar. "One thing alone," says he, "remains to be proved—that the cataclysm which caused this island to disappear was subsequent to the appearance of man in western Europe."

Termier does not believe that the question respecting Atlantis, the "fabled island" of most authors, is insolvable, though neither geology nor zoölogy, he observes, will solve it. "These two sciences appear to have told all that they can tell; and it is from anthropology, from ethnology, and, lastly, from oceanography" that he is "now awaiting the final answer." Of course, it is a *petitio principii*.

As to anthropology, it seems to me very opportune to refer here in brief to the general conclusions reached by Dr. Hrdlička of the United States National Museum with regard to the origin of man in America in his

paper "The Genesis of the American Indian" presented to the last International Congress of Americanists, Washington, 1916.[2]

The author first considers the question of the unity or plurality of the American race. In answering this question he decides in favor of the original unity of the Indian race in America. He bases his conclusion upon the similarities of language, culture, mentality, and physique. Then he takes up the question of the antiquity of the race on this continent. Hrdlička does not think that the Indian was autochthonous on this continent. This belief is based upon the absence of the inferior primates of the anthropoid type in America, upon the assumption of the unity of the species *homo sapiens*, and upon the circumstance that the primitive types of humanity living in Europe during the Quaternary or Glacial Period could not have come from America. According to this authority, no human remains of geological antiquity have been demonstrated to exist on the American continent. The third question he considers is the source of the racial elements that occupy America and the epoch of the occupation.

With respect to the first point Hrdlička passes in review the means of transportation of prehistoric man; the geographical situation of America with regard to the other continents; the anthropological characteristics of the American Indian, which he compares with the primitive characteristics of the great ethnic groups of other parts of the world. And from these considerations he concludes that the American aborigines come only from Asia.

Here we have another *petitio principii*.

On the other hand, famous anthropologists have persistently rejected the alleged Asiatic origin of American man.

Of course, relations between America and Asia, through Bering Strait, have formerly existed and still exist.[3] But we should not forget that Siberia was peopled only in a relatively recent period, in Neolithic time, and that during this period the opposite land of Alaska was covered in part by enormous glaciers, a circumstance making relations between the man of the Old World and of the New World through these regions rather improbable.

Now, accepting, as Dr. Hrdlička does, the theory of the unity of mankind, then it would appear as if we are obliged to go back to a distant geological past to prove the connection, and to assume the peopling of America from Europe. And this theory is, as far as I know, accepted by the greatest specialists in paleo-anthropology, as, for instance, Dr. Robert Lehmann-Nitsche of the La Plata Museum, and also by other noted scientists, such as Andree and Luschan.

The above quoted land-bridge, if it existed during the Eocene and until

[2] Not yet published.

[3] On one phase of these relations, the migration of mythological elements, see Paul Ehrenreich: Mythen und Legenden der südamerikanischen Urvölker und ihre Beziehungen zu denen Nordamerikas und der alten Welt (Supplement to *Zeitschr. für Ethnol.*, Vol. 37, 1905), pp. 67-68 and 77, based on the work of Boas and the Jesup North Pacific Expedition, 1897-1903.

the Pliocene and Miocene, would furnish the original connection of the early man of the Old and the New World.

Be that as it may, the antiquity of man in America is so great that—at least in the present state of our science—we can consider him autochthonous. The same may be said of American native culture and civilization. They may have received certain elements from outside; however, these infiltrations of alien cultural elements could never have influenced to any great extent the spontaneous development of American native culture.

"Did man," asks the French author, "then live who could withstand the reaction and transmit the memory of that cataclysm?" This is thus far an open question. One link is missing. Atlantis was plunged into the "gloomy sea." And will it ever be possible to disclose what the waves of the ocean conceal? I will leave it to others to answer this question.

Many scholars have thought Atlantis to be America, because Plato states that an easy passage existed from this island to other islands which lay near a continent exceeding in size all Europe and Asia. Of course, most of these accounts are speculations without scientific foundations. To prove that in Plato's work there are to be found allusions to the western hemisphere, the alleged evidence ought to be, if not incontestable, at least serious and plausible.

In the first instance, the philosopher speaks of an island called Atlantis. And the tale of the submerged island has been for many centuries the favorite theme of the superstitious mariners of the maritime centers of western Europe. As an island it is also preserved on the first cartographical productions. After the discovery of America, its name, in the form of "the Antilles," was given to the islands at the present termed "West Indies."

The study of the problem of the Island of Atlantis is unquestionably of high scientific importance. The fact that the narrative of the island's submersion has been regarded by most scholars as a "fabled tale" proves little or nothing. United science may be enabled to tell us who were those men who lived, loved, and labored in that western island ages before the tradition gave rise to the legends regarding the dangers and horrors pervading the "gloomy ocean."

(II) By CHARLES SCHUCHERT

It is well known that Professor Termier is not only a good geologist but also a great lover of the beautiful and much given to the poetic form of speaking and writing. At the recent meetings of the International Geological Congress in Canada many of us came under his spell, and we are thankful to the Smithsonian Institution for presenting so good a translation of the stimulating lecture on "Atlantis" that he delivered at the Oceano-

graphic Institute of France in 1912.[1] Most of us will agree with the facts presented, but as to his conclusions there will be differences of opinion of a fundamental kind.

We learn from Plato that an Egyptian priest told Solon (born 638 B.C.) that Atlantis, "larger than Asia and Africa," was destroyed with great earthquakes and inundations; "in a single day and one fatal night, all who had been warriors against you [Athenians] were swallowed up. The Island of Atlantis disappeared beneath the sea," seemingly at some time between 5,000 and 9,000 years before the Christian era. Atlantis had "white, black, and red" building stones and "mines yielding all the metals useful to man." Plato's description, according to Termier, "tallies well with what we would imagine today of a great land submerged in the region of the Azores," a continent sunk into the "sea of darkness" of the Egyptians, a darkness that was not dispelled until Columbus discovered America.

Termier tells us that all of the eastern Atlantic is a great volcanic zone, stretching from Iceland south for 1,900 miles, that off Europe and Africa volcanoes are abundant, and, in fact, that many of the islands in this zone "are either integrally or in greater part formed of lava," most of them rising steeply out of great depths. The Azores are true volcanic and oceanic islands, and it is almost certain that they never had land connections with the continents on either side of the Atlantic Ocean. If there is any truth in Plato's thrilling account, we must look for Atlantis off the western coast of Africa, and here we find that five of the Cape Verde Islands and three of the Canaries have rocks that are unmistakably like those common to the continents. Taking into consideration also the living plants and animals of these islands, many of which are of European-Mediterranean affinities of late Tertiary time, we see that the evidence appears to indicate clearly that the Cape Verde and Canary Islands are fragments of a greater Africa.[2] It is therefore not to the north of the Pillars of Hercules that we should look for Atlantis, but to the southwest of the rock of Gibraltar. What evidence there may be to show that this fracturing and breaking down of western Africa took place as suddenly as related by Plato or that it occurred about 10,000 years ago is as yet unknown to geologists.

Termier relates that a cable-laying ship grappling for the broken Brest-Cape Cod cable in 1898 brought up from depths averaging 3,000 meters rock splinters of a vitreous lava, a basalt known to petrographers as tachylyte. He regards this occurrence as of the greatest significance in showing that a large area of the Atlantic has gone deep beneath the surface of the ocean, concluding that the rock "could solidify into this condition only under atmospheric pressure. Under several atmospheres, and more especially under 3,000 meters of water, it might have crystallized." This

[1] See footnote 1 to preceding section.

[2] See C. Gagel: Die mittelatlantischen Vulkaninseln, *Handbuch der regionalen Geologie*, Vol. 7, Part 10. Heidelberg, 1910.

lava field having, as he holds, formed above the level of the sea, has since sunk 9,750 feet. However, as to vitreous lava also forming beneath the sea he says nothing, but petrographers admit that they know little of this possibility. At least some of them believe it can form also at the great depth cited, where the temperature of the water is near the freezing point of the Fahrenheit scale. It is not pressure so much as it is a quick loss of temperature that brings about the vitreous structure in lava. In other words, vitreous lava apparently can be formed as well in the ocean depths as on the lands. What the cable layers got was probably the superficial glassy crust of probable subterranean lava flows, and the presence of tachylyte on the ocean bottom can hardly be regarded as proof positive that a large area of the North Atlantic, recently land, is now about 10,000 feet beneath the sea.

The greater question, Was Africa ever united to South America? is being answered by biologists and geologists "Yes" and "No." The writer believes in this connection previous to the Tertiary, and thinks that the down-breaking of western Gondwana began in the late Lower Cretaceous, with complete severance long before the close of Eocene time, for marine strata of this age are general along the western border of Africa. (Gondwana during Paleozoic and Mesozoic time extended unbroken from India across the Indian Ocean to Africa south of the Sahara Desert, and across the Atlantic, embracing Brazil and much of South America.) On the other hand, if this land-bridge had continued unbroken into Tertiary time, even only as late as the later Eocene, then certainly the wonderful fossil mammalian faunas of Argentina should reveal many and unmistakable African links. The African affinities in the ancient South American mammalian faunas are, however, so slight as to give but a limited support to the theory that Gondwana was still in existence in early Tertiary time, and none at all to the theory that the South Atlantic bridge was present in the Miocene.

Even though we do not agree with Professor Termier's thesis that there is truth in Plato's Atlantis, we thank him for the glowing account he has given us, with its incidental revelations of French warmth of character and nobility of mind, and for the stimulus that the article will give to paleogeographic research.

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

Meetings of December. An inter-monthly meeting of the American Geographical Society was held on Tuesday evening, December 12, 1916, at the Engineering Societies' Building, 29 West Thirty-ninth Street. President Greenough presided. The lecture for the evening was entitled "The Argentine Pampas," by Charles Wellington Furlong, F.R.G.S. Mr. Furlong related his experiences on a journey across southern Patagonia from the Atlantic to the Andes. He also described the life of the Tehuelches, the Indians of that region, and the Onas, who inhabit Tierra del Fuego. These and other Fuegian peoples are dealt with in the article by Mr. Furlong in the present number.

The regular monthly meeting was held on December 26. President Greenough presided. He submitted for confirmation the names of 532 candidates for Fellowship, each of whom had been approved by the Council, and they were confirmed as Fellows of the Society. Thereupon Mr. Arthur Stanley Riggs delivered a lecture entitled "Colonies, Old and New."

NORTH AMERICA

A Proposed 30-Mile Tunnel under the Cascade Mountains. The Cascade mountain wall which divides eastern and western Washington has proved a barrier to the development of Puget Sound as a Pacific terminal for continental traffic. At various times in the past ten years, rail traffic across the Cascades has been stopped completely in winter by the heavy snowfall for periods of one to three weeks, and grave accidents and loss of life have occurred through avalanches. A plan to conquer this natural obstacle more adequately than at present is set forth by Brigadier-General H. M. Chittenden in *Engineering News* for November 16, 1916 (pp. 928-935). It involves the building of a tunnel about thirty miles long between the valleys of the Wenatchee and Skykomish. This is practically the route at present followed by the Great Northern Railway, which pierces the crest between the headwaters of the two rivers in the Cascade Tunnel, 13,500 feet long and 3,375 feet above sea level. The tunnels by which the two other railroad crossings of the range are effected lie farther south: the Snoqualmie Pass Tunnel, used by the Chicago, Milwaukee, and St. Paul Railway, 11,890 feet long and 2,560 feet in elevation, and the Stampede Tunnel, used by the Northern Pacific Railway, 9,834 feet long and 2,837 feet above sea level (for these routes see map in *Bull. Amer. Geogr. Soc.*, Vol. 43, 1911, p. 520).

The Wenatchee-Skykomish route is considered the most advantageous because these two opposite-flowing rivers lie almost in a straight line and also because this route crosses the range at a point where it is restricted by the westernmost projection of the Columbia Plateau. Instead of having to climb to the present tunnel elevations of 2,500-3,400 feet, the trains in the proposed line would never rise more than 1,200 feet above sea level and the maximum gradient would be reduced from 2.2 to 0.6 per cent.

In its technical aspect, the construction presents no difficulties which modern engineering cannot surmount. The cost is estimated at $50,000,000, and the time required for the completion, from five and a half years to thirteen according to the method adopted.

A comparison with the length of tunnels in the Alps is of interest. The great European mountain mass is pierced by five tunnels: Mont Cenis, length, 8 miles; Saint Gotthard, 9.2 miles; Arlberg, 6.5 miles; Simplon, 12.3 miles; Loetschberg, 9 miles.

The Exploitation of Potash in Nebraska. Jesse Lake, near Alliance on the western margin of the sand hills region of Nebraska, is acquiring fame as the site of a new American industry, the production of potash salts on a commercial scale. The industry's plant is said to be the first of its kind in North America (Victor Ziegler: The Potash Deposits of the Sand Hills Region of Northwestern Nebraska, *Colorado School of Mines Quarterly*, October, 1915; compare the note on the "Potash Resources of the United States" in the March, 1916, *Review*, p. 217). Salts extracted from the brine-saturated sand underlying the lake are used in the manufacture of fertilizers, and concentrated brine is also shipped to Michigan for use in the treatment of magnesia brines. Jesse Lake is one of the most strongly alkaline of the many lakes that are found on the pitted, wind-scoured surface of the sand hills region. The majority of the lakes are fresh or only slightly alkaline, but the waters of a small proportion are sufficiently mineralized to merit commercial consideration. Most of these are small, the average area being perhaps 100 acres. Jesse Lake is one of the larger members:

it has an area of 240 acres, and its saline content is estimated at something over 100,000 tons.

The origin of the Nebraskan deposits is attributed to human interference with the original plant cover. Before white occupation the Indian population had burned over the prairie and extensive woodland and exposed the surface to the erosive influences of a semi-arid climate. Mineral ashes from the destroyed vegetation washed into the waters that collected in the wind-hollowed depressions. Where an outlet was lacking the waters, subject to intense evaporation, became rapidly enriched in saline content. In the case of the alkali lakes properly so-called the total salts averages 4 to 6 per cent, a commercially workable amount if the extent of the deposit is sufficiently great.

Bureau of Soils Publications as Geographic Material. In the *Field Operations* and soil maps issued every year by the Bureau of Soils of the U. S. Department of Agriculture students of geography may find a rich and rapidly growing stock of new source material.

When the mapping of each unit area, usually a single county, is completed a report on it is issued in booklet form. The distinctive feature of the reports is the accompanying map of the soil types in a color overprint upon a very accurate base map in black and white on the scale of one mile to the inch. Annual volumes comprising the fifty or more booklets put out during the year are also obtainable.

To illustrate the method of treatment in each areal discussion and to exhibit the wealth of geographic material in these reports, that on Will County, Illinois (as found in the *Field Operations of the Bureau of Soils for the Year 1912*, pp. 1521-1553) is here discussed in some detail.

In the field of place geography, the report describes the drainage and its relation to the great waterways, the Mississippi and St. Lawrence systems; the location of the area with reference to state boundaries and physiographic region lines, and to the main features of the continental glacier; its position with reference to trade routes, waterways, railroads, and to the large cities.

In the field of economic geography, the uses of the streams, for power, navigation, water supply, and scenic points are discussed. Railroads, canals, and wagon roads are described. The condition of the roads and facilities for improving them, supplies of gravel, stone, and clay for brick roads are treated.

From the climatic side not only the bare statistics of averages, means, and extremes are given, but dates of killing frosts, length of growing season, distribution of precipitation through the year and in relation to the growing season, "dry spells," probability of hail and other destructive storms, and the temperature extremes in their relation to certain crops. Then comes the rainfall in relation to run-off, soil absorption and evaporation, and floods.

From the historic viewpoint are discussed the original condition as to forests, grass, game, fish, and travel, together with their relation to early settlement and development and the present culture.

Causal relations are kept well to the front. Soil types are placed and correlated with glacial and rock features and post-glacial processes. Their origin and character are carefully worked out, and their present uses and possibilities are connected with their history. The need of underdraining, facilities therefor, and materials for making drain tile are considered. Topography is not only treated descriptively, but is explained; abandoned lake beds, beaches, and moraines are located and their relation to the soils and crops is defined. The effects of both soils and topography upon the people, their distribution, occupations, and wealth are interpreted. The relation of this area to other areas and to Chicago and other markets is shown; its development is correlated with theirs.

Even the element of prognostic geography is included, in suggesting new uses for the soils and slopes, and new adjustments that can be made both to the advantage of the county and its people and also to the city markets.

Each areal report is similarly informing and stimulating. GEORGE D. HUBBARD.

The Forests of Porto Rico. Originally as well-wooded as the neighboring Santo Domingo, of whose area 85 per cent is still under virgin forest, Porto Rico is fast running through its reduced woodland resources. Only two per cent of the surface is "high" forest (tropical rain-forest), and, with the so-called "timber and brush" lands, the total of woodland is not more than 20 per cent. Yet the country is consuming annually three times as much as it produces. At such a rate depletion will be complete in less than a score of years. This condition is attributable in the main to the density of population: Porto Rico has 235.5 people to the square mile where Santo Domingo has only 33.

In the removal of the forests organized lumbering has played no part. Clearing for

agricultural purposes and charcoal burning are almost solely responsible for the denudation. The wasteful system of primitive tropical agriculture has been particularly harmful to the forests. The same spot is seldom cultivated for more than three years in succession; then another patch, preferably of virgin forest of the better type, is burned out. On the abandoned clearings grass, chaparral, or a savanna formation often compete successfully with secondary forest. Thus has originated much of the so-called pasture of little use even for stock. The total area under pasture occupies 47 per cent of the island. On the contrary the acreage devoted to commercial crops at the expense of the forest is economically justified. Sugar occupies the level, agricultural lowlands, and coffee, which grows best on steep slopes above 2,000 feet, conserves the soil cover to a great extent.

Of the original tropical rain-forest only three considerable tracts remain: that of the Sierra de Luquillo on the east and two smaller areas on the center and west center of the island cordillera. The virgin forest of Luquillo has been protected from man by the steepness of its wind- and rain-swept slopes. Part of it has been created a government reserve. Most of the remaining government land is in the grass and brush region. Afforestation could be put into practice here, but, as the extent is not great, co-operation with the land owners must form the basis of a sound forest policy. Such a proceeding, however, will be difficult, for most of the mountain holdings are small (Louis S. Murphy: Forests of Porto Rico, Past, Present, and Future, *U. S. Dept. of Agric. Bull. No. 354*, 1916).

Central American Railroads. The growth of railroad enterprise in Central America is the subject of a pertinent article in the International Edition of *Dun's Review* for October, 1916. The earliest line was that built across the Isthmus of Panama under the stimulus of the Californian gold discoveries. Begun in 1850, this short ocean-to-ocean line was only opened to traffic in 1855, after a tremendous expenditure of human life. The present line does not follow the first surveyed locations, as it has been rebuilt in parts on new rights-of-way. A new line which will eventually connect David in the southwestern part of the republic with Empire in the Canal Zone is now under construction.

North of Panama, in Costa Rica, transcontinental travel between Punta Arenas and Puerto Limon is made possible through the connection at San José of the Pacific and the Northern Railways. In Nicaragua, Leon and the important cites of Managua and Granada are connected with the Pacific ocean at Corinto. For some years proposals have been under discussion to complete transportation facilities to the Atlantic. The April, 1916, number of the *Bulletin of the Pan American Union* reports that the Pacific Railroad Company has submitted to the Nicaraguan congress a project for construction of a line between Managua and Bluefields. Salvador as yet has no means of direct communication with the Atlantic: completion of the construction undertaken by the International Railways of Central America will, however, make connection with their transcontinental road in Guatemala. This last-named line, the northernmost of the three transcontinental connections in Central America, unites Puerto Barrios on the Atlantic with the principal Pacific harbors of the republic. Here, as well as in the other republics of Central America, the main centers of activity are situated on the west coast, and railroad building has consequently progressed more rapidly on this side.

In addition to these lines many miles of plantation railways are operated by the large companies which have played an important part in the development of Central America. Over 250 miles of these lines, belonging to the United Fruit Company, are in operation in Panama alone, while on the Atlantic side of Costa Rica a network comprising 170 miles of track is owned by and operated by the same company. In Honduras this prosperous concern runs over 161 miles of plantation railways.

SOUTH AMERICA

Human Life in the Flood Region of Lowland Bolivia. A brief but interesting description of the lowland region of eastern Bolivia is given by the ethnologist Erland Nordenskiöld in a recent paper ("Die Anpassung der Indianer an die Verhältnisse in den Überschwemmungsgebieten in Südamerika," *Ymer*, 1916, No. 2). A valuable map shows the outlines of the area so extensively flooded each year during times of high water. It lies between the Andes and the Guaporé and extends northwestward to the Madidi and southeastward to the belt of higher country northeast of Santa Cruz.

Here is a region of great extremes. At times of low water the inhabitants may be required to dig to ground-water and in times of high water the same people may be able to travel only by canoe. The extensive inundations push the edges of cultivation to the higher ground and flood hundreds of villages. Even such a large town as Trinidad is

not immune, for it is said that it has but one street which has not been submerged. The rainy season begins in October, November, or December and continues until April or May, but it is not until late December or early January that the pampas are flooded sufficiently to interfere with trade.

The point of chief interest lies in the description of the numerous canals which connect the rivers and their main tributaries. By means of these canals one may cut across country in many places, thus saving long detours. The author inclines to the view that these canals are not natural features but are artificial products associated with Arawak culture. The inquiry is extended to other regions of the Amazon basin; for example, north to the Casiquiare, thence to the Orinoco and the Rio Negro. He gives a small-scale map of the region. Here again is a field of Arawak culture. The point raised is extremely interesting, and more refined hydrographic studies are now required to advance any argument in support of a natural origin for the connecting canals.

The Argentine Census of 1914. The United States consul at Rosario reports briefly on the first published returns of the Argentine census taken in 1914 (*Commerce Rcpts.*, No. 250, Washington, 1916). Argentina is now credited with a total population of 7,885,237, practically double that of the preceding census of 1895. The greatest growth is shown in the vine-growing Andean province of Mendoza, where the increase is 139 per cent. Large increases are also recorded in the provinces of the wheat belt. For the country as a whole the population density is 7 per square mile. Tucumán, with 40 inhabitants to the square mile, remains the most densely peopled province. Of comparatively small extent, it embraces a large proportion of plains-country well adapted to the sugar cultivation upon which its prosperity depends. Catamarca, lying immediately to the west and occupied by plateau and cordillera, has, on the contrary, less than 3 to the square mile. Misiones, with 5 to the square mile, has by far the greatest density of the National Territories. Much interest attaches to the statistics in regard to nationality, for thirty per cent of the population is foreign. This is a topic that will be discussed in a later issue of the *Review*.

Physical Changes during Historic Time in the Rio de la Plata Estuary. Within the last four hundred years important physiographic and biologic changes have taken place in the basin of the Rio de la Plata (Aníbal Cardoso: El Río de la Plata desde su génesis hasta la conquista, *Anal. del Museo Nacional de Hist. Nat. de Buenos Aires*, Vol. 27, 1915). The early explorers left us little in the way of detailed geographical description. Broadly they picture the shores of the great estuary from Montevideo on the east to Buenos Aires on the west covered with woods and thickets where abounded the jaguar and puma. Beyond the riverine bluffs of the west the Querandíes engaged in the pursuit of deer, guanaco, and the wild horse. In similar fashion the Charruas occupied the eastern country, whilst the friendly and pacific Guaraníes cultivated the islands of the delta. References to hydrography are few, but we glean enough to appreciate the practical importance of the changes that have transpired since the discovery of the estuary.

The exact date of the discovery remains doubtful. The first authenticated entry is that made by Juan de Solis in 1516, but it is a commonly held opinion that he effected an early voyage "in secret." Solis confined his exploration to the Banda Oriental; subsequent navigators crossed over to the western shore. Magellan, who appears to have reached the neighborhood of the modern La Plata, sailed the estuary at a speed precluding the idea that he had to feel his way by soundings. Cabot passed from the Uruguayan coast to the river Las Palmas without difficulty. The reports on his voyage are amongst our most valuable sources. They include the map showing the site of Sancti Spiritu, the first and only town in La Plata before 1536; the diary of one of his soldiers, Luis Ramirez; and the memoir of his rival, Garcia. A little later Pedro de Mendoza, founder of the first settlement of Buenos Aires, likewise crossed without trouble from Colonia to the playa on which he laid out his ill-fated colony. As late as the end of the sixteenth century this unimpeded navigation along the western shore was the experience of the largest vessels of the time. Useful data on the condition of the estuary are found in the log of a Dutch boat sailing to the La Plata in 1599. (This log in original form and as a Spanish translation is to be found in the *Anales de la Biblioteca: Publicación de Documentos relativos al Río de la Plata*, Vol. 4, Buenos Aires, 1905.)

These early observations, in harmony with physiographic evidence, suggest that with comparatively little labor and expenditure the ancient channels might be restored and vast improvement effected in navigation of the Argentine side of the upper estuary, at present only available for boats of small draft. The most direct route to the Paraná follows the channel of the Rio de las Palmas, but the bar near the mouth closes it to

vessels drawing nine feet or more. Projects to canalize this waterway to Buenos Aires have long been under consideration. A year or two ago the Argentine Senate granted a concession for the construction of the Mitre Canal, as it is called. Alternative schemes and a plan of existing and proposed routes may be found in a paper by Agustín Mercau (Canalización Artificial del Río de la Plata, *Anales de la Soc. Científica Argentina*, Vol. 62, Buenos Aires, 1906).

EUROPE

Revival of the English Channel Tunnel Project. The European war has created a revival of interest in the project of a tunnel under the English Channel. The *Engineering Record* for November 25, 1916, reproduces an article (pp. 645-646) contributed by A. Dumas in *Le Génie Civil* for October 21, 1916, in which the estimated cost of the tunnel is set at $77,000,000. Yet it is believed that the venture would prove immediately profitable. According to conservative reckoning, fifteen freight and passenger trains pulling an average load of 500 tons could be operated daily in each direction. It is estimated, however, that during the war 144 troop trains a day could be operated in one direction. An important saving would be accomplished by eliminating the present transfers between rail and water. The scheme has the great advantage of reducing the running time between London and Paris by 5½ hours, thus bringing the two capitals as close together as New York and Boston.

The plan calls for the building of twin, single-track tunnels. Only 37 miles of track are required to provide connections with the Paris-Calais and London-Dover railways. Of this distance 32 miles would be actually under water. Geological conditions appear to be favorable to tunnel construction. Its course will be laid in a highly impervious bed of argillaceous chalk (Cenomanian), which shows closely similar outcrops on either side of the channel. These outcrops determine the points of departure from the respective shores, Sangatte, north of Cape Blanc Nez, and Shakespeare Cliff south of Dover.

As is well known the scheme is by no means new. It was suggested in Napoleon's time and seriously considered before the mid-century, since when French engineers have always been interested in the venture, although considerable opposition has been met with on the British side. In 1875 a French company obtained a ninety-nine year franchise and constructed a tunnel over a mile in length from the French shore before matters reached a deadlock in 1882. This work, as well as a corresponding section at the English end built about the same time by the Channel Tunnel Company, is now available.

The *Engineering Supplement of the London Times* (August 25, 1916) discusses the tunnel scheme in relation to other solutions of cross-channel communication without transshipment—that is, apart from aircraft, by bridge or train ferry.

Iron Mining in Normandy. By the revival and new development of its iron mining, Lower Normandy, commonly regarded as a purely pastoral and agricultural region, bids fair to experience an industrial revolution not unlike that which took place in French Lorraine a quarter of a century ago. Present operations are centering around Caen, the chief port of shipment for the mine products and of entry for the imported fuel. The recrudescence of what is here a very ancient industry began with the introduction of German capital in 1909. According to the British Consul-General at Havre (*Board of Trade Journ.*, Oct. 19, 1916) the output in 1900 was only 142,000 metric tons: now, with the mines under government control, it is over 1,000,000 metric tons and is being steadily augmented. The progress of the industry is described in the article "El Fierro en Normandía" in the Chilean mining publication *Boletín de la Sociedad Nacional de Minería* (Vol. 27, Ser. 3a, No. 219, Santiago, 1915).

The Revolution in Russian Agriculture. Since the liberation of the serfs in 1861 the dominant form of land cultivation in central and eastern, especially northeastern, Russia has been the communal system. The system is a natural one in a vast, undeveloped region sparsely peopled and without capital, but it limits agriculture to a low standard. Visualize the bars to progress in the way of the peasant whose allotted land is subdivided into a hundred long, narrow strips, some perhaps not more than four or five feet wide, scattered over the communal holding of some hundreds of acres in extent! Advancement on a general scale is as clearly beyond the powers of the individual as in a different way it is with the Kentucky mountaineer.

Appreciating the necessity for outside assistance the Russian Government has for the last ten years taken a hand in the solution of the problem. Much effective work has already been carried out by the land commissions and the peasant's banks. The former have been authorized to break up the communal holdings and redistribute the

land in single blocks. With the banks they also arrange for the provision of farm buildings, implements, and other requisites for the peasant starting on his new career. Several instances of the success of the movement are related in the May, 1916, number of *Russia* (R. Martens & Co., New York). They have been drawn from the official publication "Les Travaux des Commissions Agraires (1907-1911)," St. Petersburg, 1912.

The Economic Divisions of Albania. We are indebted to Italian interest in Albania for a gradually increasing knowledge of this ill-known principality. A summary of the results attained by the Italian Scientific Mission sent to Albania in 1913 by the Società pel Progresso delle Scienze is given in the May, 1916, issue of the *Rivista Mensile del Touring Club Italiano* (pp. 290-292). From the standpoint of human occupation the land of Albania is divisible into four distinct zones extending from the summits of the inland uplifts to the shores of the Adriatic.

The highest of these zones comprises the limestone region of central Albania. It is extremely rugged and sparsely populated. Dotting the slopes between gorges and breaks are found rough shepherds' huts, the *stanni* of local appellation. Near the summits and the crested ridges, the built-up type of habitation gives way to the natural cavern or grotto, a not infrequent characteristic of this karst-like district.

The zone immediately below is that of the hilly country fringing the mountainous area. It extends over the best part of central Albania and rarely rises above 2,300 feet (700 meters). In its northern section it is characterized by a type of stone house which is well developed in the valley of the Tirana River. The lowest reaches of the zone contain the *chiflik*, or ranch type of habitation, consisting of a dwelling built centrally with reference to its appurtenances of fields and orchards. This zone is favorable for corn growing as well as for olive and tobacco cultivation.

The *chiflik*, however, is more typical of the succeeding zone, which is essentially a farming region of plains and valleys. The Musakia valley and the plain of Elbassan, a former lake-bed, are characteristic districts of the zone. Practically each valley has its urban center, sometimes—though this is exceptional—with a population as great as from five to ten thousand souls.

The last zone consists of the coastal strip of Albania. It is not thickly populated except around the ancient harbors. Sand dunes have often proved an obstacle to settlement. As a rule trade has fostered occupancy of the region, and the chief centers are found at the heads of the natural land routes, which, in antiquity, reached the heart of the Balkans by way of exceedingly arduous lines.

AFRICA

New Evidence on the Age of the Zimbabwe Ruins of Rhodesia. Dr. Randall-MacIver's theory ("Mediaeval Rhodesia," London, 1906) on the age of the Zimbabwe ruins is supported by a new line of evidence brought forward by the Rev. Samuel S. Dornan (Rhodesian Ruins and Native Tradition, *South African Journ. of Sci.*, Vol. 12, No. 11, 1916). In opposition to the theory advocated especially by R. N. Hall ("Prehistoric Rhodesia"), wherein the ruins are accredited with an age not later than 900 A. D. and attributed to Semites or Semitic influence, the former theory makes them of medieval or post-medieval age and of Bantu origin, reduces them in fact to the "level of a glorified Kafir kraal." Heretofore evidence has been solely archeological. Because of the difficulties of obtaining it, native tradition has been supposed lacking and its possibilities ignored. Mr. Dornan points out that natives now living in the vicinity of the ruins are not necessarily those who know the most about them. Within the last three hundred or five hundred years the population of Rhodesia has seen many changings and shiftings as a result of migrations of tribes from across the Zambesi and of more recent Zulu incursions. By means of patient investigation among the Makaranga tribe several traditions have been secured, and these confirm the supposition that Zimbabwe was "built by natives, inhabited by natives, and recently abandoned, probably not more than three hundred years ago."

Pastoral Control in the Transkei Territories of the Cape Province. A sudden crisis or catastrophe in the life of a people affords a test of the strength of the geographic controls by which it is governed. Three times within the last sixty years such a test has demonstrated the high importance of the pastoral control among the natives of the Transkei Territories in the eastern part of the Cape Province (Rev. J. R. L. Kingon: The Economics of the East Coast Fever as Illustrated by the Transkeian Territories, *South African Journ. of Science*, Vol. 12, No. 6, 1916).

In the middle of the last century the extraordinary delusion of the rebellious Amaxosa, involving the slaughter of their entire herds, led to the death or emigration

of thousands. At the end of the century rinderpest carried off ninety per cent of the cattle and entailed proportionate suffering on the populace, and now, during the last few years the territories have been swept by another fatal cattle disease, the East Coast fever. The loss has been tremendous. Some idea of its magnitude may be gained from the fact that 23 out of the total of 27 districts have been involved and that in the five of them alone from which official estimates are forthcoming the direct loss in cattle has been placed at £1,250,000.

But this represents only a portion of the financial loss, and the effects of the disaster have permeated the whole physical and mental as well as the economic life of the people. With mealies and Kafir beer, milk forms the staple of native diet. Reduction of the milk supply produced an immediate effect in increased infant mortality. It also put a strain on agricultural resources, as yet little developed for a people who number 50 to the square mile. Moreover, both allied and unconnected events combined to diminish even the usual productivity of the land. Manure was lacking and cattle were unavailable for ploughing and the consequences of shallow planting magnified the effects of the serious drought that obtained during 1912. The native farmer, with his harvest commonly pledged for former debts, was thus compelled to buy back necessities at exorbitant prices. In addition, the dislocation of traffic impeded help that might otherwise have been forthcoming. Although the railroad mileage is being extended and motor vehicles are entering into general use, the ox-cart still remains the ordinary medium of transportation. The shortage of oxen and still more the stringent regulations created to prevent the spread of infection paralyzed communication.

Again, cattle constitute the native savings bank: they are the common form of investment. With their decrease not only was the purchasing power of the people curtailed but debts could not be paid and morality suffered. The moral effect penetrated deeper. The ceremony of marriage requires a payment in cattle by the bridegroom to the father of the bride. In cases where the requisite number of cattle could not be obtained immoral relations were apt to result, though, on the other hand, the practice of polygamy was greatly curtailed. Yet the consequences of the plague were not wholly evil: one may note the effect on education. By it many herd boys were set free for unwonted schooling. Native relations with the Government were not so happy. Measures to cope with the epidemic naturally fell heavily upon individuals and were often misunderstood. Police duty was increased, and in extreme instances military force had to be employed.

It is not improbable that this blow to pastoral life may favorably influence the new agricultural movement that is already being felt in the territories (Rev. J. R. L. Kingon: Native Agriculture, *South African Journ. of Science,* Vol. 12, No. 5, 1915.) It is true that the native has been and still is very wasteful. He has destroyed much of the original forest and its animal population. In his cultivation he clings to the old tribal customs. His staples—mealies, Kafir corn, pumpkins, beans, and sugar-cane —are sown together, broadcast and indiscriminately; ploughing is seldom done to an adequate depth; rotation of crops is not followed and irrigation is scarcely developed, in spite of the liability of droughts such as that of 1912. Underlying many of the native practices one still finds the old fear of witchcraft. Many yet attribute a good harvest to a good "medicine" rather than to proper cultivation. But the spread of agricultural education and the change in land ownership encourage hope for the gradual transformation of the primitive tribal ideas and methods. As the Government surveys progress land is gradually passing from communal to individual tenure, the practice of enclosure is growing, and with it the possibilities of better agriculture.

ASIA

A Numerical Estimate of the Christians of the Turco-Persian Border. Attention to the plight of the inhabitants of the Turco-Persian boundary zone has recently been attracted by the outrages to which they have been subjected through the lawlessness prevailing in the region. Thanks to the zeal of missionaries stationed at various points in the valley of the Tigris and in the lake region of the Armenian highlands it is now possible to reach a likely estimate of the number of the Assyrian Christians, more frequently referred to as Nestorians, and related groups. The statistics derived from native sources by missionary efforts have been collected recently by Dr. W. W. Rockwell in a pamphlet entitled "The Pitiful Plight of the Assyrian Christians in Persia and Kurdistan," published by the American Committee for Armenian and Syrian Relief, New York, 1916. According to this document the Christian element in the valley of the Tigris around Mosul comprises twelve thousand families aggregating 71,652 inhabitants. The majority consists of Roman Catholic Uniats. An important group is made up of Jacobites, some 11,400, who are descendants of the followers of the church organized by

Jacob Baradai in the second half of the sixth century. Four thousand of these Christians are Nestorians.

In the highlands of Kurdistan the 92,000 tribal or semi-independent Christians are mainly Nestorians. The largest community occupies the Tyari region. On the Persian side, in Adarbaijan, between 30,000 and 35,000 Christians are scattered in the Lake Urmia region, especially in the valleys of the three short rivers which empty into the lake from the west. Altogether the number of Assyrian Christians is estimated at 198,452. In this aggregation 115,800 recognize the Mar Shimun, or patriarch of the Nestorians, as their leader.

Sir Aurel Stein's Latest Expedition in Central Asia. In the August and September, 1916, numbers of the *Geographical Journal* Sir Aurel Stein outlines the main results of his latest expedition, conducted on behalf of the Indian Government in the western Gobi, Chinese Turkestan, the Pamirs, and Seistan in eastern Persia. During the two and a half years so spent (August, 1913, to February, 1916) the explorer traveled over 11,000 miles, acquired a rich archeological collection and much material of geographical and historical interest, and with his assistants surveyed and mapped some hundreds of square miles of territory, part of which had never before been seen by European eyes. Notices of the earlier operations of the expedition have appeared in the *Bulletin of the American Geographical Society* (Vol. 46, 1914, pp. 531 and 771; Vol. 47, 1915, pp. 533 and 774-775). They extend from the start of the expedition in Kashmir to its most easterly field in the Pei-Shan Gobi of southwestern Mongolia. Some of the important events of the later journeys are here summarized.

November, 1914, saw Sir Aurel and his assistants in the depression of Turfan in the northeastern corner of Chinese Turkestan. Much detailed research was carried out here, for, as is well known, this basin, like its larger counterpart, that of the Tarim, is of critical importance in the interpretation of climatic change and human relations. With this in view a detailed survey was made on the scale of one mile to the inch. Several excavations were conducted, one at Idikut-shahri, long ago identified as the site of Kao-chang, the capital of Turfan in the seventh to eighth centuries A. D., when the region was an important Chinese administrative center and a great trading place between China and Western Asia. In Turfan the explorer was joined by his surveyor Lal Singh, who had carried his triangulation to the vicinity of Lou-lan in the Lop Desert. Later Lal Singh connected this work with that done in the Kwen-lun and thence via the Kuruk-tagh with surveys in the Tien-shan.

Striking south by the now unpopulated country of the rugged Kuruk-tagh, Sir Aurel followed the line of oases along the southern base of the Tien-shan to Kashgar. His archeological finds convinced him that the area under cultivation in Buddhist times was in excess of the present irrigation resources, which he carefully measured. The Kashgar River was pursued to its western headwaters and the divide crossed to the Alai valley, on the old road of the Chinese silk traders to the Oxus. Thence a little-known route was selected southward across the Pamir plateau over great glacier-clad ranges presenting valuable data on recent glacial retreat. From Lake Victoria, in the heart of the Pamirs, the famous legendary source of the four great rivers of Asia, the upper Oxus valley was followed on the Russian side. In the region inhabited by the Wakhis modern economic development claimed attention on account of the material progress made by these people, now secure alike from Kirghiz raids and Afghan exactions.

From the upper Oxus rapid marches through Bokhara brought Sir Aurel to Samarkand and the Russian Central-Asian railway, on which he proceeded to Ashkabad on the border of the Persian plateau. Crossing this southward he arrived in November, 1915, in Seistan, the self-contained basin on the Persian-Afghanistan boundary, a plane-table survey on the scale of four miles to an inch being made en route. In Seistan discoveries of Buddhist remains proved the previously suspected Iranian link connecting the Greco-Buddhist art of northwestern India with the Buddhist art of Central Asia and the Far East. From Seistan the return to India was made through the Baluchistan desert: Srinagar was reached in the middle of March. There the vast amount of archeological material collected will undergo preliminary examination and arrangement prior to removal to its permanent home in the Museum of Indian Art and Ethnography at Delhi.

Rainfall and Crops in India. Increasing attention is being paid to relations between weather and crops. This is a practical application of meteorological data which suggests many future economic possibilities. In India, with its dense population and its extremely critical monsoon rainfall, much interest is naturally taken in such investigations. A recent number of the *Memoirs of the Indian Meteorological Department* (Vol. 21, Part 14, 1916) contains a discussion of the correlation of rainfall and the succeeding crops, with special reference to the Punjab, by S. M. Jacobs. The area selected for study, in the Doab, between the rivers Beas and Sutlej, has no canals and, as a rule, very little flooding. The problem of rainfall effect is, therefore, comparatively

simple. It is clearly recognized that the complexity of the question of forecasting the crop is very great. The area sown, for example, is determined by such factors as the price of seed, labor, population, mortality, standard of living, and political changes. Nevertheless, unless the fluctuations of these contributing causes are unusually large, the rainfall control stands out clearly enough. The determination of the yield per acre is less of an economic problem and more purely one of meteorology, soil physics, and plant biology.

The predictions thus far made of the sown area show a distinctly close correspondence between observed and calculated results, the probable error being 5.6 per cent of the mean. The predictions of the crop, based on a formula developed by the author, show a close agreement with the actual conditions. The author concludes that this method of correlation makes it possible "to establish prediction formulæ of both sowings and yield which represent with accuracy the effect rainfall has on crops." While the formulæ might "undoubtedly be improved," they already have a practical value "which modern statesmanship cannot afford to ignore." R. DEC. WARD.

AUSTRALASIA AND OCEANIA

Upper Air Research in Australia. The first report on upper air research in Australia has been published (*Commonwealth Bureau of Meteorol. Bull. 13*, Melbourne, 1916). Difficulties have been encountered owing to the fact that Melbourne is on the south coast of Australia and the prevailing winter winds, as well as the upper currents in advance of cyclonic disturbances, are from a northerly direction, and thus carry the balloons out to sea. The work has been greatly curtailed because of the war and the consequent enlistment of many officers with the Australian Imperial Forces. The first ascents of *ballons sondes* were made in 1913, and there were fifteen in all, ending in May, 1915. The balloon track and the accompanying weather conditions are charted for each ascent, together with "altitude-graphs" showing the temperatures recorded. The general conditions for this work have been so unfavorable that nothing but preliminary results are to be expected. The mean height of the "isothermal layer," or stratosphere, above Melbourne is 10 kilometers. R. DEC. WARD.

Extension of the Boundaries of the Gilbert and Ellice Islands Colony. The *Board of Trade Journal* for May 25, 1916, reproduces an Order-of-Council dated January 27, 1916, from the *London Gazette* of May 19, according to which the boundaries of the Gilbert and Ellice Islands Colony are extended so as to include Ocean Island, immediately west of the group, and Fanning and Washington Islands, several degrees to the east. A later order, dated February 29, effected the further annexation of the Union Islands to the southeast, with all small islands, islets, rocks, and reefs depending on them, to the Gilbert and Ellice Islands Colony. A notice concerning the original group appeared in the February, 1916, number of the *Review*, p. 145.

PHYSICAL GEOGRAPHY

The Melting of Snow. A study of the melting of snow at Albany, N. Y., has been made by Mr. Robert E. Horton. The period of observation covered February-March, 1914, and the changes in depth, density, and water-equivalent of the snow accumulation were noted. The subject is an important one for engineers, as well as for meteorologists. A number of conclusions are reached, among which a few may here be noted. If snow melts at the surface, or if warm rain falls on it, most of the water percolates down through the body of the snow, provided the latter is at about 32° Fahrenheit, and a part of the water adheres to the snow crystals as a capillary film. When snow overlies unfrozen ground, or frozen but porous and unsaturated soil, most of the water from melting percolates to the bottom of the snow layer, and thence into the soil. The melting of snow or warm rain falling upon a snow cover under suitable conditions is thus more favorable to the replenishment of ground water than would be an equal volume of rainfall on a bare surface, since, in the presence of snow, surface run-off is greatly retarded and the opportunity for infiltration increased. Under suitable conditions, especially in woods where the ground is least frozen, a deep layer of snow on level ground may wholly disappear by invisible percolation without causing any run-off whatever (*Monthly Weather Rev.*, Vol. 43, 1915, pp. 599-605). R. DEC. WARD.

The Origin of Cyclones and Anticyclones. In a recent paper on "The Local Circulation of the Atmosphere" (*Monthly Weather Rev.*, 1916, pp. 182-186), W. H. Dines concludes that the known relationships between pressure and temperature are explicable on simple dynamic principles if the disturbance is supposed to start at 8 or 9 kilometers and to spread downward, resulting in the production of the familiar surface

phenomena. It is not yet clear how the upper winds which blow around a certain region start, or strengthen, or cease. But it is certain that, however a low-pressure area is produced, it is not due to the high temperature of the air above it. R. DEC. WARD.

GEOGRAPHICAL NEWS

PERSONAL

MR. EDGAR J. BANKS, field director of the Babylonian Expedition of the University of Chicago to Bismaya, gave a lecture on December 8, 1916, before the Geographic Society of Chicago entitled "A Thousand Miles down the Tigris River."

MR. C. WILLIAM BEEBE, curator of ornithology of the New York Zoölogical Society, read a paper on December 18, 1916, before the New York Academy of Sciences on "Zoölogical Studies of British Guiana."

PROFESSOR A. P. BRIGHAM of Colgate University will give two courses at the coming Summer School session at Columbia University: (1) Geographic Influences in American History; (2) Geography of New York State.

PROFESSOR NATHANIEL L. BRITTON, director-in-chief of the New York Botanical Garden, on the occasion of the annual meeting of the New York Academy of Sciences on December 18, 1916, presented a report on the progress of the natural history survey of Porto Rico which is being conducted under the auspices of the New York Academy of Sciences (see *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 210-211).

MR. HENRY G. BRYANT, president of the Geographical Society of Philadelphia, on the occasion of the celebration, on December 6, 1916, of the twenty-fifth anniversary of the founding of the society, addressed the members on "Men and Members of the Early Days of the Society."

PROFESSOR REGINALD A. DALY of Harvard University read a paper at the twenty-ninth annual meeting of the Geological Society of America at Albany, December 27-29, 1916, on "New Test of the Subsidence Theory of Coral Reefs."

PROFESSOR ELIZABETH F. FISHER of Wellesley College gave an illustrated lecture on November 28, 1916, before the Appalachian Mountain Club of Boston on "The Contrasted Scenery of the Sierra Nevada and Rocky Mountains."

PROFESSOR J. PAUL GOODE of the University of Chicago gave a lecture on January 3 before the Geographical Society of Philadelphia on "The Geographic Causes of the Great War."

PROFESSOR D. W. JOHNSON of Columbia University addressed the Germanistic Society of America on December 15 on "Topographic Features as an Influence in the European War" and the American Philosophical Society of Philadelphia on January 5 on "The Strategic Geography of the Balkan Campaign."

MR. CHARLES KEYES read a paper at the twenty-ninth annual meeting of the Geological Society of America at Albany, December 27-29, 1916, on the "Orographic Origin of Ancient Lake Bonneville."

PROFESSOR E. M. LEHNERTS of the University of Minnesota will give two courses at the coming Summer School session at Columbia University: (1) Map Interpretation; (2) Field Work in Physiography (in the metropolitan district and Hudson River region).

PROFESSOR HARRY FIELDING REID of Johns Hopkins University read a paper at the twenty-ninth annual meeting of the Geological Society of America at Albany, December 27-29, 1916, on "Geometric Plans of the Earth, With Special Reference to the Planetesimal Hypothesis."

DR. HERBERT J. SPINDEN of the American Museum of Natural History read a paper on December 18, 1916, before the New York Academy of Sciences on "Ethnic Relations between Venezuela and Porto Rico."

PROFESSOR FREDERICK STARR, associate professor of anthropology at the University of Chicago, lectured on November 10, 1916, before the Geographic Society of Chicago on "Aztec Mexico."

MR. NORMAN TAYLOR of the Brooklyn Botanic Garden announces a course on phytogeography at that institution. The course will deal with plant distribution. Prerequisites are courses in plant ecology and geology and a good general knowledge of climatology and systematic botany.

DR. TALCOTT WILLIAMS, director of the School of Journalism of Columbia University, on the occasion of the celebration, on December 6, 1916, of the twenty-fifth anniversary of the founding of the Geographical Society of Philadelphia, addressed the members on the "Past and Future of the Society."

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in Vol. II, pp. 77-81

NORTH AMERICA

UNITED STATES

General

HENRY, A. J., chairman, E. H. BOWIE, H. J. COX, and H. C. FRANKENFIELD (Board composed of). **Weather forecasting in the United States.** 370 pp.; maps, diagrs. *Weather Bur.* [*Publ.*] *No. 583.* U. S. Dept. of Agric., Washington, D. C., 1916.

The study of the atmosphere began when primitive man observed the local weather signs. These he used as prognostics, in foretelling coming weather changes. Gradually a collection of weather proverbs was built up, and today, in spite of the "official" forecasts, all of us still depend more or less upon local signs and prognostics. As in the earliest days, so now, weather forecasting is the aspect of atmospheric study which has the widest popular interest. It is the immediately practical human aspect of meteorology and for that reason appeals to every one. Thus it is natural that any published discussion of weather forecasting should attract attention.

The present volume is the outgrowth of a desire on the part of the Weather Bureau to bring together the principles which have guided the official forecasters in their daily work, in order that the experience of those who have gone before may be available for the guidance of those who are to come after. Various members of the forecasting staff have contributed to the volume, and the whole has been compiled by an editorial board under the chairmanship of Professor A. J. Henry. There have been a good many publications which have treated various aspects of the forecasting problem, especially from the "popular" standpoint, but the present discussion is by far the most complete of them all.

Let it not be thought that this series of discussions on weather forecasting will furnish "interesting reading," in the ordinary meaning of those words. There are too many details, of forms, and movements, and interactions, and characteristics of cyclones and anticyclones, to give the volume the popular appeal which its title suggests. Students of meteorology who desire to make a serious attempt to master the principles of weather forecasting in the United States will find it an invaluable text-book and guide. And others, interested in the pedagogic aspects of the science, will find the carefully selected standard "type" maps very helpful for purposes of illustration and discussion.

Those who read the volume through cannot fail to be impressed with the extraordinary complexity and difficulty of weather forecasting. Here we find the forecasters telling us all their "secrets," and making clear to us just what considerations govern them in their daily work of weather prediction. And here we find, also, many general matters, pertaining to other aspects of meteorology. Thus we read (p. 126): "The observant forecaster can add but little of importance toward clearing up the source of energy of the high . . . . . It seems reasonable to assume that radiation to space has an important bearing upon the formation and maintenance of highs." The modifying influence of the Great Lakes on cold waves is clearly pointed out (pp. 151-152). The series of type weather maps showing conditions favorable for frost in different sections of the country (Figs. 101-124) and of snow and sleet types (Figs. 163-170) are especially noteworthy. The conclusion is reached (p. 202) that "a dew point reading in the evening is no indication of the ensuing minimum temperature." In the discussion of fog forecasts there are two *new* text figures showing fog frequency on the Atlantic and on the Gulf coasts (Figs. 171, 174). The chapter on long-range forecasts contains the none too emphatic statement "That there is not at this time, nor is it probable that there will be in the near future, a sound basis for such forecasts is . . . unquestionably true," with, it may be added, the notable exception of the Indian monsoon forecasts. Reference is made to the now well-recognized importance of the weather controls exercised by "centers of action," and a series of "precepts" is listed (pp. 345-346) which embody the results reached in the Forecast Division regarding the control of the weather in the United States by our neighboring "centers of action." A bibliography of works *in English* dealing with forecasting concludes the volume.

The Weather Bureau has done a good service in having this series of studies of weather forecasting compiled and published. Teachers and students of meteorology, although not directly interested in forecasting, will here find much information about our weather types and phenomena, and, as suggested above, will be able to put to good use the many excellent "type" maps. It is a pity that so valuable a publication should be known officially as "W. B. No. 583"—surely a nondescript designation.

R. DEC. WARD.

JAMES, G. W. **Our American wonderlands.** ix and 297 pp.; ills., index. A. C. McClurg & Co., Chicago, 1915. $2.00. 8 x 5½.

The only map in this volume is an outline on the inside of the cover and on the first fly-leaf locating the places which serve as themes of about thirty chapters which make up the book. The geographer would like to see some local maps included, but perhaps their absence is justified by the author's intention to arouse interest in American scenery rather than to provide a guide book. All the places but three are west of the Mississippi River, a plan supported in part by nature and perhaps fully by the experiences of the author. The three chosen features in the East are the Mammoth Cave, the Natural Bridge of Virginia, and Niagara. It would be easy to enlarge the eastern list and perhaps to improve it without making it larger. It is appropriate that a volume which opens with the Grand Canyon, the masterpiece of nature in America, should close with a waterfall the most studied, the most written about, and the most visited of all phenomena of its class.

The author's choice is not only western, but southwestern. He could not omit Mt. Rainier, Glacier National Park, the Yellowstone, or Crater Lake, but, duty done, he moves southward. Colorado comes off with Pikes Peak, the Garden of the Gods, and Mesa Verde, but Utah perhaps would like to add to her natural bridges the story of her Wasatch and of her Great Salt Lake, with its wonderful history. California, New Mexico, and Arizona claim major places in the author's appreciation, and the choice in some cases betrays his favoritism. But the purpose is worthy—while war shuts Americans from too exclusive visits across the sea, to open to them the greater natural glories of America. James thinks also that the cliff dwellings are as fascinating as Rhine castles, and the Hopis, Apaches, and Navajos more picturesque than the peasants of Switzerland, Ireland, or Russia. The volume is illustrated with about one hundred and fifty views, and the text is vivacious and interesting.

A. P. BRIGHAM.

BAILEY, L. H. **The forthcoming situation in agricultural work—II.** *Science*, Vol. 43, 1916, Jan. 21, No. 1099, pp. 77-87. [Retiring vice-presidential address, Section M, American Association for the Advancement of Science, Columbus, O., meeting.]

BAUER, L. A. **Work done by the United States Coast and Geodetic Survey in the field of terrestrial magnetism.** *Science*, May 12, 1916, pp. 666-667. [Abstract of an address at the centennial exercises of the U. S. Coast and Geodetic Survey.]

BLACK, W. M. **The United States Corps of Engineers and its relation to the United States Coast and Geodetic Survey.** *Science*, May 12, 1916, pp. 669-670. [Abstract of an address at the centennial exercises of the U. S. Coast and Geodetic Survey.]

BOWIE, WILLIAM. **The one-hundredth anniversary of the United States Coast and Geodetic Survey: Account of the celebration.** *Science*, May 12, 1916, pp. 655-656.

BURGER, W. H. **Contributions of the United States Coast and Geodetic Survey to geodesy.** *Science*, July 7, 1916, pp. 4-11. [Address given at the centennial exercises of the Survey.]

—— **Climatological data for the United States by sections: Year 1915** (Vol. 2, No. 13). 346 pp.; maps. *U. S. Weather Bur.* [*Publ.*] *No. 576.*

—— **Cotton production in the United States: Crop of 1915.** 28 pp. Bur. of the Census, Dept. of Commerce, Washington, D. C., 1916.

FAUST, A. B. **Swiss emigration to the American colonies in the eighteenth century.** *American Hist. Rev.*, Vol. 22, 1916, No. 1, pp. 21-44. [Essay based on material in Swiss archives on the distinctive features of Swiss emigration: (1) governmental obstruction at home, (2) social ostracism, (3) deprivation of all rights and privileges. Also a record of important Swiss colonial expeditions to America, chiefly to South Carolina and Pennsylvania.]

—— **Geographic Board, United States, Fourth report of the, 1890 to 1916.** 335 pp. U. S. Geographic Board, Washington, D. C., 1916. [Contains the official spelling of all names passed on by the board since its inception.]

GROSVENOR, G. H. **The land of the best: (A tribute to the scenic grandeur and unsurpassed natural resources of our own country).** Ills. *Natl. Geogr. Mag.*, Vol. 29, 1916, No. 4, pp. 327-430. [Remarkable photographs, many of which are of geographic value.]

GROVER, N. C., A. H. HORTON, AND W. E. HALL. **Surface water supply of the United States, 1914. Part 3: Ohio River basin.** xxxii and 125 pp.; ills., index. *U. S. Geol. Survey Water-Supply Paper 383.* Washington, D. C., 1916.

HAZARD, D. L. **Results of magnetic observations made by the United States Coast and Geodetic Survey in 1915.** 80 pp. *U. S. Coast and Geod. Survey Special Publ. No. 36.* Washington, D. C., 1916.

—— **Highways, National, and good roads everywhere.** 49 pp.; maps, ills. National Highways Assoc., Washington, D. C., 1913.

JAMES, J. A. **Some phases of the history of the Northwest, 1783-1786.** *Proc. Mississippi Valley Hist. Assoc. for the Year 1913-14*, Vol. 7, pp. 168-195. [A discussion of the relation of George Rogers Clark to some of the phases of Western history during the three years after the declaration of peace.]

JOHNSON, D. W. **The contribution of the United States Coast and Geodetic Survey to physical geography.** *Science*, May 12, 1916, pp. 673-674. [Abstract of an address at the centennial exercises of the U. S. Coast and Geodetic Survey.]

JONES, G. M. **Government aid to merchant shipping.** 265 pp.; index. *Bur. of Foreign and Domestic Commerce Special Agents Ser. No. 119.* Dept. of Commerce, Washington, D. C., 1916.

JOSEPH, SAMUEL. **Jewish immigration to the United States from 1881 to 1910.** 209 pp.; bibliogr. *Columbia Univ. Studies in Hist., Econ. and Public Law*, Vol. 59, 1914, No. 4. Longmans, Green & Co., New York, 1914. $1.25. 10 x 6½. [For extended review, see article "Our Immigrant Problem," by Ellsworth Huntington in the December, 1916, *Review*, pp. 458-463.]

LA FLESCHE, FRANCIS. **Protection of Indian lands.** *Rept. of the 33rd Ann. Lake Mohonk Conference on the Indian and Other Dependent Peoples, Oct. 20, 21, and 22, 1915*, pp. 70-72.

LITTLEHALES, G. W. **Hydrography and charts, with special reference to the work of the United States Coast and Geodetic Survey.** *Science*, May 12, 1916, pp. 670-671. [Abstract of an address at the centennial exercises of the U. S. Coast and Geodetic Survey.]

MACFARLANE, J. J. **American trade in 1915.** Diagrs. *Commerc. America*, Vol. 12, 1916, No. 11, pp. 9, 11, 13, and 15.

MCWILLIAMS, R. F. **Our neighbors of the south.** *Proc. Mississippi Valley Hist. Assoc. for the Year 1913-14*, Vol. 7, pp. 334-346. [Comparison, by a Canadian—hence the title—of the development of the Canadian West and the Northwest of the United States.]

MENDENHALL, T. C. **The one hundredth anniversary of the U. S. Coast and Geodetic Survey.** *Science*, July 14, 1916, pp. 45-50. [Address given at the centennial exercises of the Survey.]

MOORE, J. H. **The United States Coast and Geodetic Survey's part in the development of commerce.** *Science*, May 12, 1916, pp. 667-669. [Abstract of an address at the centennial exercises of the U. S. Coast and Geodetic Survey.]

PILLSBURY, J. E. **Ocean currents and deep-sea explorations of the United States Coast and Geodetic Survey.** *Science*, May 12, 1916, p. 667. [Abstract of an address at the centennial exercises of the U. S. Coast and Geodetic Survey.]

POOR, C. L. **Oceanic tides, with special reference to the work of the United States Coast and Geodetic Survey.** *Science*, May 12, 1916, pp. 672-673. [Abstract of an address at the centennial exercises of the U. S. Coast and Geodetic Survey.]

North Atlantic States

COMSTOCK, SARAH. **Old roads from the heart of New York.** xxiv and 401 pp.; ills., index, bibliogr. G. P. Putnam's Sons, New York, 1915. $2.50. 9 x 6.

Belongs to the type of gossipy historical annals, but is based on ample historical knowledge and attractively illustrated. The ancient roads are followed in a diffuse way, and sometimes with a superabundance of anecdote, into Long Island and Staten Island, westward into New Jersey and northward along the Hudson.

There are two folding maps, one of the date 1828, "showing the country thirty miles

round the City of New York,'' and a larger map of the same area drawn for this volume. This map shows the railroads and trolley lines, with sufficient fullness of names to make the map a useful guide to the text. For a student already familiar with the lore of Old New York and with leisure for many short journeys the book is a helpful companion. To the general reader, with small local knowledge, the work makes a less effective appeal.

There are about one hundred half tone views, a good chapter of ''easy routes for the traveler of today,'' and a bibliography of more than one hundred titles.

A. P. BRIGHAM.

GOODNOUGH, X. H. **Rainfall in New England.** Map, diagrs. *Journ. New England Water Works Assoc.*, Vol. 29, 1915, pp. 237-438. Boston.

Mr. Goodnough's paper is one of the many that appear in the *Journal of the New England Water Works Association* and that deserve the careful attention of meteorologists and climatologists. Most of it consists of a full series of tables showing the monthly rainfall in New England and at a few neighboring stations. No previous tables have embraced so many records in addition to those made under the direction of the U. S. Weather Bureau.

In his text Mr. Goodnough gives a new map of rainfall in New England. It shows with great clearness the effect of relief in causing abundant rainfall at high altitudes and on the eastern side of the main highlands. It also emphasizes the diminution of rainfall from the coast inland. A series of diagrams emphasizes another and much less commonly recognized contrast between the coast and the interior. On the coast the rainfall in summer is decidedly less than in winter, for New England is only a little north of the latitudes where subtropical summer droughts prevail in large parts of the world. Even a hundred miles inland, however, the summer indraft and winter outdraft due to continental heating and cooling cause a reversal, so that summer rains much exceed those of winter. All over New England the summer rainfall is almost the same, which is good for agriculture, but the winter rainfall, which is of chief importance in determining the value of a water supply for city use or for power, varies a good deal from the favored coast to the less favored interior.

Mr. Goodnough also discusses the question of periodicity in rainfall. He agrees with other observers in finding no regular period, but he is impressed by the fact that periods of ten or fifteen years sometimes have a rainfall quite persistently above or below normal. He also calls attention to the fact that during the first half of the last century severe droughts seem to have been more frequent than during the second half.

ELLSWORTH HUNTINGTON.

BLACK, G. F. **List of works in the New York Public Library relating to the geology, mineralogy, and palæontology of New Jersey.** *Bull. New York Public Library*, Vol. 20, 1916, No. 6, pp. 501-525.

DUBLIN, L. I. **Factors in American mortality: A study of death rates in the race stocks of New York State, 1910.** Diagrs. *Amer. Econ. Rev.*, Vol. 6, 1916, No. 3, pp. 523-548.

GOLDTHWAIT, J. W. **Glaciation in the White Mountains of New Hampshire.** Map, diagr. *Bull. Geol. Soc. of Amer.*, Vol. 27, 1916, No. 2, pp. 263-294. [The author concludes that Alpine glaciation in the White Mountains took place *before* the last advance of the continental ice sheet. The local glaciers were probably confined to favorable situations on the sides of the peaks which exceed 4,500 feet elevation; and continued long enough to carve out well-defined cirques. The ensuing ice sheet, which moved from northwest to southeast, obliterated all local valley moraines, but spared the cirques at the heads of the ravines.]

GREENE, NELSON. **The story of old Fort Plain and the middle Mohawk Valley.** xv and 399 pp.; maps. O'Connor Brothers, Fort Plain, N. Y., 1915. $1.50. 9 x 6½. [''A review of Mohawk Valley history from 1609'' to the present, ''treating particularly of the central region comprised in the present counties of Herkimer, Montgomery, and Fulton.'']

GUERNSEY, S. J. **Notes on explorations of Martha's Vineyard.** Map, diagrs., ills. *Amer. Anthropologist*, Vol. 18, 1916, No. 1, pp. 81-97. [Archeological survey near Gay Head.]

—— **Iroquois Indian groups of the New York State Museum, The.** *Science*, June 16, 1916, pp. 844-846.

KATZ, F. J. **Note on a moraine in northwestern New England.** *Science*, July 21, 1916, p. 102.

MAXON, E. T., AND W. R. CONE. **Soil survey of Clinton County, New York.** 37 pp.; maps. Bur. of Soils., U. S. Dept. of Agric., Washington, D. C., 1916.

SEALEY, D. A. **Rapid transit work in 1915, New York City.** Maps. *Engineering News*, Vol. 75, 1916, No. 18, pp. 842-849.

SKERRETT, R. G. **A difficult piece in subaqueous rock excavation.** Map, ills. *Scientific American*, Sept. 9, 1916, pp. 235 and 247. [Coenties Reef is the chief stumbling block to navigation in the East River. Under it will pass the Whitehall-Montague St. tunnel connecting Manhattan and Brooklyn.]

WELLS, J. P. **Record flood from melting snows passes through Rochester, N. Y.** Maps, diagr., ills. *Engineering Rec.*, Vol. 73, 1916, No. 15, pp. 476-478.

EUROPE

BRITISH ISLES

MARTIN, E. A. **Dew-ponds: History, observation, and experiment.** 208 pp.; ills., index. T. Werner Laurie, Ltd., London, [1915?]. 6s. 7½ x 5.

Situated on the downs of England and notably in the region of Kent and Sussex there are a number of small ponds which, because they hold water even during long dry periods, have attracted special attention. These ponds are higher than many that are entirely evaporated or that dry up during a prolonged drought.

Mr. Edward A. Martin questioned the efficiency of dew in the replenishment of these ponds, and therefore took up an elaborate study of them in the hope of arriving at a safe conclusion as to their source of water supply. Many of the more noted of the dew-ponds were carefully watched. Thermometers were placed in and about the ponds. Observations as to the rainfall, amount of dew, humidity, and fogs in the vicinity of the downs were made. Finally a special pond was constructed for experimental purposes.

From the historical standpoint, these ponds have a special interest, for it is believed that they may date back to the time of Neolithic and possibly of Paleolithic man. They now supply drinking water for stock, and possibly they may have been the source of water for early peoples living upon these downs. They are located in the region of the chalk beds, and the puddled chalk is efficient in preventing waters from sinking readily into the ground. They have in some cases been constructed with great care, and layers of straw have been interbedded with rocks and clays. The experiments and observations carried on by Mr. Edwards convinced him that the ponds are not replenished by the formation of dew upon the water surface, nor by the formation of dew on the lands or shrubbery about the ponds. He has found that the amount of dew which forms upon the downs is quite insufficient to account for the perennial nature of these higher ponds. The mists and fogs, however, which are very common and which render the vegetation about the ponds "wringing wet," must be important factors in supplying water upon the downs; and these, with the help of rainfall, must account for the replenishment of the water supply. It would seem more appropriate to use the term "mist-pond" rather than "dew-pond." W. W. ATWOOD.

PERRIS, G. H. **The industrial history of modern England.** 603 pp. Henry Holt & Co., New York, 1914. $2.00. 7½ x 5.

A book by an economist who has dug deep into his material, and handled it well from the scientific standpoint. He also has a pleasing element of the dramatic in his writing. He thinks the world once suffered greatly from *a priori* philosophizing, and his aim is "to state and classify facts, not to deduce eternal and immutable laws."

He thinks the hundred and fifty years from 1760 to 1910 are a veritable alp in the plain of human history. This period falls into three parts, divided by 1815 and 1850—dissolution, stagnation, and reconstruction. He shows himself a modern in that he sees the reconstruction not primarily by *men*, but by forces. "England has been fundamentally remade . . . . . The greatest of those governing personages with whom the historians are mainly concerned look small in the perspective of this mighty change. Its sheer violence overclouds most of our story. The individuals who emerge mimic the tumult of the impersonal forces that drive them on, shouting as the Wagnerian hero must shout through an orchestral whirlwind."

Mr. Perris shows his kinship to the geographer who believes that man's environment made him. In fact he simply carries the point on into an environmental detail—a man's occupation. "As surely as the dyer's hand shows his trade does the technique of every industry, from the simplest to the most complex, reflect itself, not only in the individual, but in the collective and social character of the workers."

The book ends with an acceptance of the doom of perpetual change, while we continue to discover new powers in nature. "The industrial revolution has no beginning and no

end.'' There are thirty-three pages of appendices giving useful facts and figures on British production, population income, foreign trade wages and prices.

J. RUSSELL SMITH.

ARMSTRONG, J. S., JR. **Bristol.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 19j, pp. 1-11. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

BISSOLI, LUIGI. **Problemi di geografia commerciale conseguenti alla coscrizione militare inglese.** *L'Esplorazione Commerc.*, Vol. 30, 1915, No. 12, pp. 441-445.

D[INES], J. S. **Atmospheric pollution in English and Scottish towns.** By J. B. C. Kershaw. *Monthly Weather Rev.*, Vol. 44, 1916, No. 3, p. 114. [Reprinted from *Science Abstracts*, Sect. A, Jan. 31, 1916. See also note in October, 1916, *Review*, p. 307.]

HATHAWAY, C. M., JR. **Hull.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 19j, pp. 11-28. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

MCCUNN, J. N. **Glasgow.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 19i, pp. 1-10. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

MACMILLAN, H. R. **Notes on state forestry in Ireland.** *Forestry Quarterly*, Vol. 14, 1916, No. 3, pp. 461-466. [''Ireland, alone of the four divisions of the United Kingdom, has made an organized beginning in state development of forestry. That this should be so is one of the fruits of the remedial land legislation of the last two decades.'']

SMITH, ALEXANDER. **A summer in Skye.** With introduction by W. F. Gray. xviii and 574 pp.; ills., index. W. P. Nimmo, Hay, & Mitchell, Edinburgh, 1912. 8 x 6.

STRAHAN, AUBREY, N. F. MACKENZIE, H. R. MILL, AND J. S. OWENS. **The investigation of rivers: Final report.** 93 pp.; maps, diagrs. *Royal Geogr. Soc. Special Publ.* London, 1916.

WADDELL, P. H. **Troon agency [Scotland].** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 19i, pp. 10-12. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

ASIA

INDIA

MUNSON, ARLEY. **Kipling's India.** xii and 204 pp.; ills., index. Doubleday, Page & Co., Garden City, N. Y., 1915. $1.50. 9½ x 6½.

A delightful journey from Bombay to Mandalay via Simla, the Khyber Pass, the Ganges plain, Calcutta and Rangoon, described, with the help of many quotations from Kipling and numerous excellent photographs, by one who knows India at first hand and has the ability to make lively pen pictures.

Doctor Munson has rendered a fine service to general readers in giving most of Kipling's India stories a geographical setting. Yet the setting is not complete unless the reader has an atlas at hand, for the book lacks a much-needed map. If the author herself had made greater use of a map she would not have Simla ''on the northeastern border [of India] among the Himalaya Mountains.''

The book will lead those who know their Kipling to reread his India stories in the light of their surroundings with enhanced pleasure. It will induce the uninitiated, if there be such, to make friends with this master of the art of story telling and his entrancing characters. Some may say that an attempt to so interpret Kipling's India will dispel his remarkable magic and mystery of atmosphere. But those who are geographically inclined will gladly welcome the attempt to give the stories a habitation.

Geographers, and perhaps others, would wish less space given in the book to the background of racy stories of Anglo-Indian social life and more to the setting of the tales of native life. However, as it is, there is much of human geography woven into the journey from where ''The Injian Ocean sets and smiles'' before Bombay to ''the Road to Mandalay.''

SUMNER W. CUSHING.

COTTER, G. DE P. **Contents and index of the Memoirs of the Geological Survey of India, Vols. 21-35, 1884 to 1911.** 119 pp. Calcutta, 1916.

DUCHESNE, A. E. **India: A storehouse of empire.** Ills. *United Empire*, Vol. 7, 1916, No. 5, pp. 327-329.

HAYDEN, H. H. **General report of the Geological Survey of India for the year 1915.** *Records of Geol. Survey of India*, Vol. 47, 1916, Part 1, pp. 1-41. Calcutta.

HOLLAND, T. H. **Quinquennial review of the mineral production of India.** xlvi and 296 pp.; maps, diagrs., index. *Records of Geol. Survey of India*, Vol. 46. Calcutta, 1915.

—— **Plains of northern India, The, and their relationship to the Himalaya Mountains.** *Nature*, No. 2436, Vol. 97, 1916, July 6, pp. 391-393. ["Abridged from an address to the Indian Science Congress at Lucknow on January 13 by the president, Sir Sidney Burrard, F.R.S."]

RUNDALL, L. B. **The ibex of Sha-Ping and other Himalayan studies.** xiv and 152 pp.; ills. Macmillan and Co., Ltd., London, 1915. $3.50. 10 x 7½. [Big-game hunting in the Himalayas.]

—— **Sind, Sea-borne trade of, in 1915-16.** *Board of Trade Journ.*, No. 1,030, Vol. 94, 1916, pp. 556-557. [Notes that in the Punjab the monsoon of 1915 was much less active than usual, with rain falling only in "sporadic showers at long intervals;" consequently the total area sown to crops in 1915-16 was 27 per cent below normal. In Sind, although the inundation of the Indus was one of the lowest recorded, the favorable set of the rivers at the mouths of the irrigation canals maintained the level normal and cultivation as usual.]

—— **Statistical abstract relating to British India. No. 45: 1900-01 to 1909-10,** viii and 288 pp; **No. 46: 1901-02 to 1910-11,** viii and 293 pp.; **No. 47: 1902-03 to 1911-12,** viii and 293 pp.; **No. 48: 1903-04 to 1912-13,** viii and 285 pp; **No. 49: 1904-05 to 1913-14.** Index. *British Parliamentary Papers Cd. 6017, 6637, 7078, 7799, and 8157*, respectively, London, 1911, 1913, 1913, 1915, 1916.

WORKMAN, F. B. **Four miles high.** Ills. *The Independent*, June 5, 1916, pp. 377-378 and 380, 382, 383. [Ascents in the Himalayas.]

WORKMAN, W. H. **The mountaineering aspect of Himalayan glaciers.** Ills. *Alpine Journ.*, No. 210, Vol. 29, 1915, pp. 284-300.

AUSTRALASIA AND OCEANIA

AUSTRALIA, NEW ZEALAND

COTTON, C. A. **The structure and later geological history of New Zealand.** Maps, diagrs., ills. *Geol. Magazine*, Decade 6, Vol. 3, No. 6, 1916, pp. 243-249; No. 7, pp. 314-320.

The author of this paper has recently published an excellent outline of the coastal physiography of New Zealand in the *Review* ("The Fault Coasts of New Zealand," Vol. 1, 1916, pp. 20-47). The present paper forms a fitting complement to the earlier one, and, since both are planned in a comprehensive way and represent the latest information, they constitute a standard source of material on the physiography of New Zealand. They deserve special attention on account of the extraordinary variety of forms related to block faulting. It is shown that the skeleton or oldermass of New Zealand is largely composed of sedimentary rocks whose deformation in late Jurassic or early Cretaceous times produced a great mountain range with a geanticlinal structure. But the folds of this oldermass are not now in agreement with the main features of the two chief islands. The shore-line cuts diagonally across the folds, giving the ridges and intervening valleys an *en échelon* arrangement. The strike of the rocks is in general 10° to 15° east of north, while that of the coast is northeast. The coasts themselves have been formed by faulting of very complicated nature, as described in the paper referred to above.

The oldermass was reduced by long-continued erosion to at least moderate relief before the deposit of covering beds (Cretaceous). In places the erosion surface was somewhat hilly when submergence and deposition began, so that some hills survived as islands during a portion of the period in which the sedimentary cover was developed. There followed a period of uninterrupted deposition extending far into the Tertiary. Then came orogenic movements to which the present relief is entirely, or almost entirely, due. This occurred in or about the Pliocene period and was characterized by block faulting, local in its effects. Many of the valleys are tectonic in origin; of like origin are some remarkable intermontane basins drained by rivers that flow out of the basins through deep gorges cut across the oldermass of bordering, upthrown blocks. In some of the uplifted blocks, the surfaces of which were slightly tilted from their former horizontal attitude, remnants may be seen of the fossil denudation plain now exposed

by the erosion of the covering strata. The article is accompanied by a figure which shows a fragment of such a plain in South Canterbury. In places the faulting to which we have referred is so minute and general that the landscape is described as "a mosaic of blocks."

BLATCHFORD, T. **The geology and mineral resources of the Yilgarn goldfield.** 189 pp.; maps, diagrs., ills., index. *Geol. Survey of Western Australia Bull. No. 63*, Part 51, Perth, 1915. [A region midway between Kalgoorlie and Perth in southwestern Australia, with a rainfall under 10 inches a year. Part of the water supply comes from an extension of the well-known Coolgardie scheme, part of it from large reservoirs sunk in the dry watercourses. For the rest, the report consists of detailed notes on the mining geology of the region.]

BRITTAIN, J. I. **Australia.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 60a, pp. 1-8. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

CAMBAGE, R. H. **Notes on the native flora of tropical Queensland.** Maps, ills. *Journ. and Proc. Royal Soc. of New South Wales for 1915*, Vol. 49, 1916, Part 3, pp. 389-447. Sydney.

CAPRA, GIUSEPPE. **La Vittoria: Il giardino Australe.** 50 pp.; ills. Prem. Scuola Tip. Calesiana, Milan, 1913.

COTTON, L. A. **Some geo-physical observations at Burrinjuck.** Diagrs. *Journ. and Proc. Royal Soc. of New South Wales for 1915*, Vol. 59, 1916, Part 3, pp. 448-462. Sydney. [Abstracted under the title "A New Experiment on the Strength of the Earth's Crust" in the December *Review*, p. 473.]

HARPER, L. F. **Geology and mineral resources of the southern coal-field. Part I—The south coastal portion.** xiv and 410 pp.; maps, diagrs., ills., index. *Memoirs Geol. Survey of New South Wales No. 7.* Sydney, 1915. [The greater part of this memoir is devoted to detailed geology, vulcanology, and petrology.]

HUNT, H. A. **Australian monthly weather report and meteorological abstract: January, 1913.** Maps. *Commonwealth Bur. of Meteorol.* [*Publ.*], Vol. 4, No. 1, pp. 5-60. Melbourne, 1916.

HUNT, H. A. **Australian monthly weather report and meteorological abstract: February, 1913.** Maps. *Commonwealth Bur. of Meteorol.* [*Publ.*], Vol. 4, No. 2, pp. 65-119. Melbourne, 1916.

MAGELSSEN, W. C. **Melbourne.** *Suppl. to Commerce Repts.*, Ann. Series, 1916, No. 60a, pp. 8-23. Bur. of Foreign and Domestic Commerce, Dept. of Commerce, Washington, D. C.

MURRAY, R. A. F. **The Tanjil or Russell's Creek gold-field.** 20 pp.; map, diagrs., index. *Bulls. Geol. Survey of Victoria No. 38.* Victoria, 1916.

SÜSSMILCH, C. A., AND W. G. STONE. **Geology of the Jenolan Caves district.** Diagrs., ill. *Journ. and Proc. Royal Soc. of New South Wales for 1915*, Vol. 49, 1916, Part 3, pp. 332-384. Sydney. [With section on physiography.]

WHITELAW, O. A. L., J. P. L. KENNY, AND J. G. EASTON. **The Mitta Mitta tin and gold-field.** With petrographic notes by D. J. Mahony. 23 pp.; map, diagrs., ills. *Bulls. Geol. Survey of Victoria No. 37.* Victoria, 1915.

WORLD AS A WHOLE AND LARGER PARTS

BANSE, EWALD. **Illustrierte Länderkunde.** Herausgegeben unter Mitwirkung von J. Daneš, M. Holzmann, O. Nordenskjöld, und anderen. 335 pp.; map, ills. George Westermann, Braunschweig, 1914. 9½ x 6½.

The title is indeed justified, for there are 64 illustrations that are admirable for beauty and geographic interest, starting off with a view so unusual as that of Mecca. But the point of the book is not in its wonderful pictures nor its geographic descriptions, but in its presentation of the world in fifteen "natural divisions" instead of six continents and two groups of polar lands. Readers of *Petermanns Mitteilungen* will recall Ewald Banse's paper on the Orient (Vol. 55, 1909), conceived as including Persia, Asia Minor, and Arabia, with Africa north of the Sahara, a theme later elaborated in three small volumes (The Atlas Region, The Arabian Orient, The Aryan Orient, B. G. Teubner, Leipzig, 1910). The Orient is the main home of Islam, a unit under many aspects, although it includes parts of two continents. The idea is a good one, for it abandons time-honored but arbitrary notions that hinder progress.

In this volume Banse extends his principles of divisions into natural units to the

whole world. (A preliminary paper, with map, appeared in *Petermanns Mitteilungen* for 1912. The map, substantially the same as that which accompanies the present work, was reviewed in the *Bull. Amer. Geogr. Soc.*, Vol. 44, 1912, p. 240.) Eight authors have aided him with results that are very uneven: Africa south of the Sahara is *Nigritia*. *Europe* is one division as far east as 25° from Greenwich—in mid-Russia. Here *Greater Siberia* begins, to extend to the Pacific. *Mongolia* is a division by itself. *East Asia* includes Manchuria, Korea, Japan, and eastern China. *India* takes in Indo-China and the East Indies. *Greater Australia* means New Guinea, New Zealand, and the rest of the islands with the continent Australia. *Arctis* and *Antarctis* explain themselves. *Central America* includes the West Indies. North of this the mountainous West is *Cordilleria* and south of it *Andina*. From the Rockies eastward to the ocean is *America*, and east of Andina is *East South America*.

This is a most interesting attempt. Greater Australia, Greater Siberia, and Nigritia are acceptable at sight. India and Central America open up more discussion with their inclusion of the East and West Indian islands, for insularity has marked geographic consequences. East Asia has an enormous range of geographic contrasts as compared with the monotonous Orient. In other words, the Orient is a relatively simple group of earth features. To match it throughout the world would give a very large number of natural divisions, many more than Banse's fifteen. This is strikingly true of "Europe," a natural division of great complexity, of which the Mediterranean border is closely allied to the African coast, which is so large a part of Banse's Orient. On many grounds "Europe" might well include North Africa down to the Sahara, for the Sahara is a true boundary, while the Mediterranean has always put its border peoples into communication, instead of separating them. Ethnically and culturally the boundary lies in the Sahara. Nigritia is an excellent unit from this viewpoint.

The American divisions, by Alwin Oppel and Willi Ule, are not prepossessing. Mexico and Alaska are as poor bedfellows in Cordilleria, as Venezuela and Chile in Andina. There is nothing about East South America to suggest a natural division, and the name is cumbersome. Only political considerations, which the Canadians would appreciate little, could recommend America as a name for the basins of the Mackenzie, the Mississippi, and the St. Lawrence, together with the Atlantic coast border. Its further subdivision into *Hudsonia* east and west of Hudson Bay, *Appalachia* in the mountains and eastward, and *Missouria*, to include the St. Lawrence and Mississippi basins, is even less attractive. The customary separation of America into two-world divisions at the Isthmus may be open to question; the reviewer finds better grounds for division at the Rio Grande into Latin and English America. It is worth while to note in passing that common use has come to accept the continent names as including more than the actual continent, in the sense of the land mass that holds together. English people may talk of going "to the Continent" when they visit France or Germany, but they and we know they are Europeans themselves and the British Isles a part of Europe. So Japan is a part of Asia, like Ceylon, Sumatra, and Java.

The present attempt deserves attention. One cannot try to assign boundaries to geographic divisions without focusing attention on the *criteria*. What would make a geographic division natural? MARK JEFFERSON.

—— **Annuaire Météorologique, 1913, II: Les Iles Féroé, l'Islande, le Groënland et les Antilles.** 88 pp. Dansk Meteorol. Inst., Copenhagen, 1916.

CORNISH, VAUGHAN. **The strategic geography of the British Empire, considered in relation to the Central Powers.** *United Empire*, Vol. 7, N. S., 1916, No. 2, pp. 142-160. [Abstracted in the July *Review*, pp. 66-67.]

DUNNING, W. A. **The British Empire and the United States.** With introduction by Right Honourable Viscount Bryce and preface by N. M. Butler. xix and 381 pp.; index. Charles Scribner's Sons, New York, 1915. $2.00. 9 x 6.

HARDING, GEORGE. **Coaling-ports of the world.** Ills. *Harper's Mag.*, No. 793, Vol. 133, 1916, pp. 27-37. [An account of the picturesque aspects of Port Said, Singapore, Nagasaki, Gibraltar, and Colombo, the most celebrated of the one hundred and forty coaling ports of the world. In the age of sail a vessel could go from China to Liverpool without touching at a port of call. The present-day mail steamer must renew its coal supply frequently even if it must "buy an island" for the purpose. The tramp steamer, built chiefly for cargo, is a slave to the geographical distribution of coaling ports and must figure out its coal schedule as carefully as its cargo schedule. There is a last section on the coal ports of the Caribbean and the Pacific in relation to the interests of the United States.]

HAZARD, D. L. **Results of magnetic observations made by the United States Coast and Geodetic Survey at the time of the solar eclipse of August 21, 1914.**

Terrestr. Magnet. and Atmosph. Electr., Vol. 21, 1916, No. 1, pp. 9-14. [Values for the stations Vieques, Porto Rico, Cheltenham, Md., Tucson, Sitka, Honolulu.]

JUMELLE, HENRI. **L'avenir de nos colonies.** Ills. *La Nature*, No. 2226, 1916, May 27, pp. 337-345. [French colonies.]

NEWBIGIN, M. I. **The interrelations of Europe and Asia as exemplified in the Near East.** Map. *Scottish Geogr. Mag.*, Vol. 32, 1916, No. 5, pp. 216-227.

ROBERTSON, J. A. **Bibliography of early Spanish-Japanese relations, compiled from manuscripts and books in the Philippine Library, Manila.** iv and 170 pp.; ills. *Trans. Asiatic Soc. of Japan*, Vol. 43, 1915, Part 1. Tokyo. [Introduction abstracted in the June *Review*, pp. 461-462.]

RONCAGLI, G. **Francia e Italia in Oriente e in Africa.** *Boll. della Reale Soc. Geogr. Italiana*, Vol. 5, 1916, No. 7, pp. 606-612. Rome.

W—, W. C. **Latin-American exports: An opportunity.** Ills. *Bull. Pan American Union*, Vol. 43, 1916, No. 2, pp. 190-204.

EDUCATIONAL GEOGRAPHY

ANDREWS, A. W. **A text-book of geography.** xii and 655 pp.; maps, diagrs., index. Edward Arnold, London, 1913. $1.25. 7½ x 5½.

As one of the most ambitious attempts in recent times to cover the whole field of geography in a single, usable text, this work deserves special notice. It runs to about 230,000 words, as compared with 150,000, 170,000, and 210,000 in the three texts most prominent in England and America. The omission of all illustrations except 115 black-and-white maps renders possible a book of convenient size and weight.

The style is a marvel of condensation. The sentences are short and clearly constructed, but packed with phrases and clauses, each of which adds to the load of meaning. The reader may count on having to take in, on an average, one new idea with every line, or about forty to the page. His ability to do so will depend on his powers of apperception. The process is made more difficult by an excessive use of the parenthesis, not only to interpolate incidental ideas, but for matter logically related to the context. Citations to matter which follows later in the book are so frequent as to constitute a system of pro-ference, rather than of reference. If they are looked up, they are found to fill a gap, but the gain in avoiding repetition is overbalanced by the loss in time and patience of the reader. Condensation, parentheses, pro-ferences, and unsparing use of complex concepts, regardless of the immature or uninstructed mind, render the book rather hard reading at first even for the seasoned geographer. If these difficulties are forced down, more geography will be found to the page than in any other book known to the reviewer. The command and use of facts make it what the author disclaims an attempt to provide, a condensed encyclopedia of geographical information. But more than that, there are few instances where isolated facts are given without explanation or suggestion of correlation with other facts, and thus the encyclopedia is transformed into an organic system. The principal strands on which organization is effected are climate and communications.

Under general geography, climate is treated in a thorough and original manner and without restraint. By the use of the isotherms of 32°, 50°, and 68°, the face of the earth is divided into ten zones and regions in each hemisphere, hot at all seasons, hot summers and warm winters, hot summers and cool winters, hot summers and cold winters, warm at all seasons, warm summers and cool winters, warm summers and cold winters, cool at all seasons, cool summers and cold winters, and cold at all seasons—a set of distinctions sufficiently fine. Practical exercises are set, based on a table giving climatic conditions at from 50 to 150 selected stations for each continent. From these data the student is expected to compile his own maps. If he does it in the light of the parallel discussion of the text, he will have a good working knowledge of the climates of the world. This is made the key to the distribution of natural vegetation and cultivated crops in the best modern manner.

Each continent is illustrated by a set of maps showing sea-level isotherms, actual isotherms, isobars, and winds and rainfall, each for January and July, a relief map shaded between contours selected to bring out desired contrasts in each case, a map of river basins and of vegetation. The use of large-scale orographic maps is constantly insisted on. In descriptions of relief, there is little said about ranges and peaks, but the subject is developed according to passes, valleys, trade routes, and lines of communica-

tion, which lead to the location of towns and cities. The resulting picture is one of fine detail rather than of impressionistic breadth.

In 95 pages of general geography, land forms, maps and map reading (elaborately), climate and biogeography are discussed, including the distribution of man and important economic products. Regional geography, which occupies the bulk of the book, is treated in the main according to political divisions. In the preliminary description of each continent, natural regions and their importance are not overlooked, but the aim is to present a view of ethnic, economic and social, rather than of physiographic units. First place is given to the British Isles, which occupy 70 pages. The usual classification of rocks and geological formations is made geographical by indicating their influence upon relief, soils, vegetation, and industries. In such a country, where natural divisions are small, well defined and generally recognized, regional description is delightfully easy and satisfactory. The links of the geographical chain which runs through the Lancashire cotton industry are fully traced in less than half a page. Salisbury Plain and the Vale of Wardour furnish occasion for a little gem of compressed and polished geography, showing the intimate relationships of structure, landscape, chalk downs, valleys, coombs, soils, flints, glacial features, quarries, pastures, ploughland, woods, plant associations, bird life, sheep, wheat, village sites, Stonehenge, Old Sarum, Roman roads, Salisbury Cathedral, base line of Ordnance Survey, military camp, and modern railways.

Europe occupies 170 pages; Asia, 105, and Africa, 73. Space forbids quotation, but tempting samples may be found in the cow as the dominating influence in the life of Alpine peasants (p. 267), the description of the Pamirs (p. 341), and the story of the Congo quest (p. 404). That no more space is given to North America than to Africa and considerably less than to Australia and South America combined is evidence either that North American geography is very simple or that the British geographer lacks a sense of proportion. It is to be hoped that the absurdity of the time-honored precedent of placing America after New Zealand and the Pacific tail-ends of the world, so that Hawaii is presented before the United States, may, in the lapse of ages, become evident to European geographers. A similar sentiment is aroused by the 17 pages given to the 7,000,000 inhabitants of Canada preceding 20 pages given to the United States with its population of 100,000,000. The section on the United States is the least satisfactory in the book, partly on account of brevity and partly on account of flaws which one on the ground can easily pick. In two pages on the development of communications in North America nothing is said about events later than 1800, except the Canadian Pacific, Grand Trunk Pacific and Canadian Northern Railways. A full-page map of the Canadian Rockies, showing river trenches, passes, and railways, is admirable. Cape Ann, Mass., is canonized and Anglicized into St. Anne's Head. New York, the second city, first seaport, and imminent commercial and financial center of the world, is dismissed in a dozen lines of fine print. Chicago ("on L. Huron") is said to be "to the north of deep ravines cut by the Ohio tributaries in the glacial moraine lands." (Ye shades of the Wabash, the Kankakee, and the Illinois!) The elevations of the Great Lake ports are given as being from 100 to 260 feet above the lake levels, and the river ports of the Missouri, from Great Falls and Bismarck down, are stated as a student of the map might think they ought to be rather than as they are. Iron is still mined in the Ozarks, but mining in the plateau states is only incidentally mentioned. Central California is placed in "a desert depression," the first Pacific railways "turned the southern end of the Sierra Nevada in 1866," and coal mining is made more important in Washington than lumbering. The Panama Canal, "owing to tidal differences of level between the Pacific and Atlantic, will contain locks," and is accounted for by reference to Spanish mule trails and the railroad of 1855.

Jupiter is said to have nodded sometimes, and infallibility is superhuman. The American teacher would shrink from the adventure of piloting even a robust class through Mr. Andrews' book, but if he did, the class would know enough geography, outside that of the United States, to last them a lifetime. C. R. DRYER.

DICKS, A. J. **Cambridge geographical text books: Intermediate.** xi and 362 pp.; maps, diagrs., ills., index. University Press, Cambridge, 1912. 8 x 5½.

Production of a general geography compressed into three hundred pages is a difficult task unless carried out in the light of some dominant guiding principle. Such a principle is not apparent in the above text, which, partaking of the nature of a gazetteer, is chiefly open to criticism on the selection and veracity of the facts presented. Material is fairly distributed regionally, but errors abound and there are some serious omissions. A cursory examination reveals the statement that "Spain holds none of the mainland" of Africa and former German Southwest Africa is entirely ignored. In the section on

South America we are told that "more than half the coffee (of Brazil) is exported from Rio Janeiro" (in 1910, to take a year data for which should have been available for the text, the entire export trade of Santos was nearly two and a half times that of Rio Janeiro and 99 per cent of it was coffee!); that in Bolivia the llama is "the only animal which can be used for mountain traffic" (no mention of the importance of transportation by mule). Other statements are misleading. La Paz (Bolivia) is the greatest market for cinchona from the *montaña*, but the description of it as located "in the center of the cinchona district" is ambiguous. The teacher of the literal-minded, fourteen-year-old pupil will anticipate trouble from such an unfortunate term as "'Indo'-European" applied to the Peruvian *mestizo*. Causal connections might have been further developed without introduction of more material. Thus the nitrates of Chile might have been placed in the Atacama Desert mentioned in the previous paragraph, instead of being simply listed with other mineral products.

HAAREN, J. H. **First notions of geography.** For fourth-year classes. v and 154 pp.; ills. D. C. Heath & Co., New York, 1914. 45 cents. 8 x 6.

Intended for pupils beginning the fourth year of the elementary school. The aim is to give the child a knowledge of the fundamentals of geography. Such subjects are taken up as weather, direction, clouds, rivers, seasons, food, clothing, shelter. The pupil is prepared to read a map. A great deal of the text is written in story form, the story being of an imaginary school-teacher and her class. By means of this teacher and her school the author gives the real child his "first notions of geography."

WILBUR GREELEY BURROUGHS.

BABER, ZONIA. **Lost opportunities in teaching geography.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 8, pp. 295-298.

BARKER, MABEL. **Education for a state of peacedom through regional study. (A conference on regional surveys, V.)** *Geogr. Teacher*, No. 43, Vol. 8, 1915, Part 3, pp. 169-172.

BELL, VALENTINE. **Regional survey in the elementary school. (A conference on regional surveys, III.)** *Geogr. Teacher*, No. 43, Vol. 8, 1915, Part 3, pp. 164-166.

BRANFORD, V. V. **The regional survey as a method of social study. (A conference on regional surveys, II.)** *Geogr. Teacher*, No. 42, Vol. 8, 1915, Part 2, pp. 97-102.

BROWN, R. M. **Home-made maps and atlases.** *Journ. of Geogr.*, Vol. 15, 1915-16, No. 3, pp. 77-79.

CORNMAN, O. P., AND OSCAR GERSON. **Geography by grades, New York State edition: Third and fourth years.** 223 pp.; maps, diagrs., ills. Hinds, Noble & Eldredge, Philadelphia and New York, 1911. 8 x 6.

—— **Current material for the geography teacher.** *Journ. of Geogr.*, Vol. 15, 1916-17, No. 3, pp. 98-101. [Quotations from various current sources.]

CUSHING, S. W. **High-school commercial geography.** *Journ. of Geogr.*, Vol. 15, 1916-17, No. 3, pp. 87-91.

FLEURE, H. J. **Regional surveys in relation to geography. (A conference on regional surveys, I.)** *Geogr. Teacher*, No. 42, Vol. 8, 1915, Part 2, pp. 89-96.

GARLICK, S. A. **The filing and presentation of illustrated geographical material.** Diagrs. *Journ. of Geogr.*, Vol. 15, 1916, No. 3, pp. 95-97.

—— **Geography: A report on a preliminary attempt to measure some educational results.** 38 pp.; diagrs. *Dept. of Educ. Investigation and Measurement Bull. No. 5 (School Document No. 14-1915)*. Boston, 1916.

GOODE, J. P. **Geography.** *Commercial Educ. Bull. No. 25*, pp. 52-53. Bur. of Education, Washington, D. C., 1916. [Author's abstract of a paper read at the Commercial Education Subsection of the Second Pan American Scientific Congress held in Washington, December, 1915–January, 1916.]

GROSE, H. D. **How library work, field work, and laboratory work may be made mutually supplemental in the teaching of earth science.** *Journ. of Geogr.*, Vol. 14, 1915-16, No. 7, pp. 253-256.